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THE SITE OF PREDILECTION IN CROSS-INFECTION FROM THE RIGHT TO THE LEFT LUNG[1]

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INFECTIONS of the right lung which result in destruction of pulmonary tissue not infrequently give rise to infection in the opposite lung. This we have termed "cross-infection." It is an autogenous infection due, apparently, to the inhalation of infectious exudate and detritus (Fig. 1).

Although cross-infection of this type may occur in any part of the left lung, there is such a tendency for it to occur in a local region comprising about a fourth of the lung midway between the apex and the base, that this can be considered the site of predilection. In roentgenograms made in the usual postero-anterior projection this area lies between the second and fifth ribs. This entire area may be originally involved but usually early there will be a limited focus somewhere in this quadrant (Fig. 2).

When the destructive lesion involves particularly the right upper lobe one would ex-

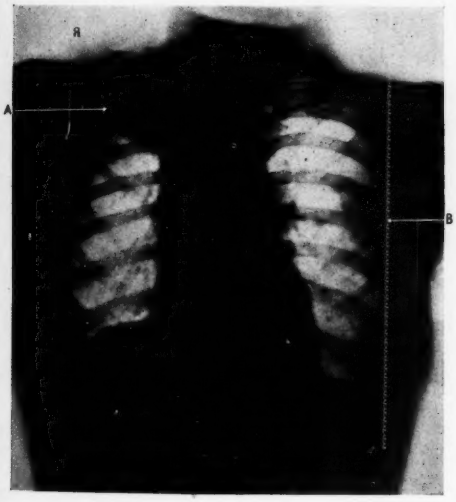

Fig. 1. Tuberculosis of right upper lobe *(A)*. Secondary cross-infection of left lung *(B)*.

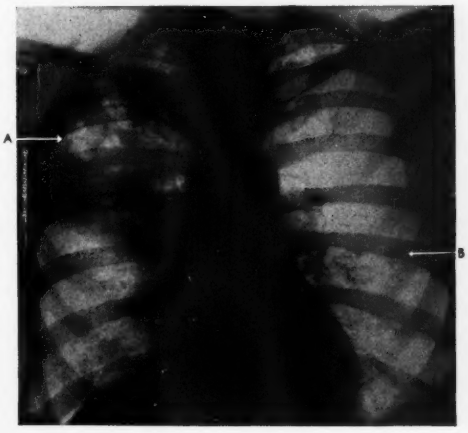

Fig. 2. Tuberculosis of right upper lobe which has resulted in cavitation *(A)*. At *(B)* there is a small area of cross-infection of the left lung.

[1]This paper was presented by Dr. Russell Wright Morse and Dr. William Gregory Cole at the Toronto Meeting of the Radiological Society of North America, Dec. 2 to 6, 1929.

Fig. 3. Destructive tuberculosis of right upper lobe *(A)*. At *(B)* there is a diffuse cross-infection of the left lung. The involvement is largely peripheral. At *(C)* there is secondary infection of the lower part of the right lung. The involvement is mostly peribronchial.

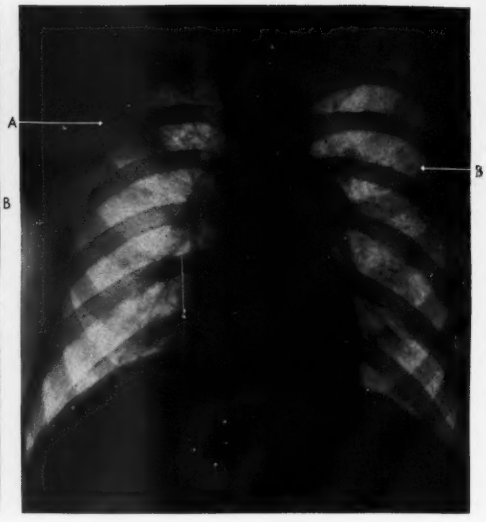

Fig. 4. Tuberculous pneumonia in right upper lobe *(A)*. Cross-infection of left lung *(B)*.

pect aspiration infection of the right lower lobe to precede cross-infection, as the bronchus to the right lower lobe is an almost direct continuation of the trachea. This type of secondary infection does occur quite frequently, usually in association with cross-infection; but the infection is largely limited to the peribronchial tissues and those alveoli adjoining the bronchi. The secondary infection in this region does not as a rule involve the peripheral parenchyma to the extent that the parenchyma is involved in cross-infection. In some cases, however, secondary infection of the lower lobe is more extensive and of greater importance than cross-infection of the left lung (Figs. 3, 4, 5, 6, and 7).

Cross-infection has been observed most frequently in the presence of a breaking down or cavitation of a caseous tuberculous lesion. This one would expect, as tuberculosis is the most common cause of pulmonary destruction (Fig. 8).

Case I.—The following case of caseous pneumonia of the right lower lobe illustrates the progressive involvement of the right upper lobe and the early involvement of the left lung by cross-infection.

4-10-29: Two weeks after an abdominal operation, there is consolidation of the right lower lobe—caseous pneumonia. There is also a diffuse infiltration in the right upper lobe. The left lung is apparently clear (Fig. 9).

4-12-29: Relatively little change is noted except a small area of infiltration at the anterior end of the second rib on the left side. This was not noticed when the films were originally studied.

4-17-29: The area of cross-infection is slightly larger. It was still unrecognized (Fig. 10).

6-3-29: There is considerable increase in the area of cross-infection, and also in the infiltration of the right upper lobe (Fig. 11).

7-11-29: Extensive involvement of the left lung and the right upper lobe (Fig. 12).

Case II.—This case illustrates the progressive involvement in a fatal case of pneumonic tuberculosis. The patient was a 15-year-old Negress, admitted to the Fifth

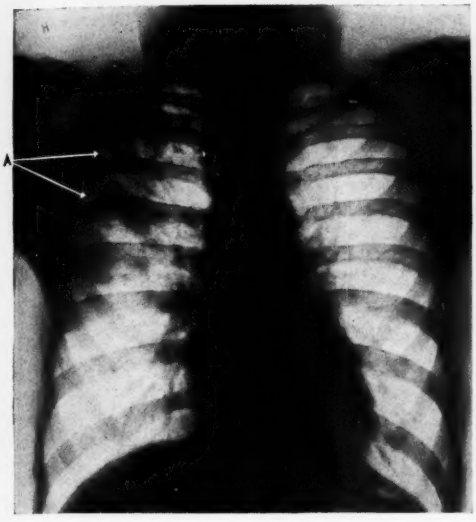

Fig 5. Sept. 13, 1929. Bronchopneumonic type of tuberculosis of right upper lobe. Notice that at this time there is no infection of the lower or middle lobes of the right lung and no cross-infection of the left lung. Within ten days caseation necrosis resulted, with cross-infection of the left lung and involvement of the lower part of the right lung. (See Fig. 6.)

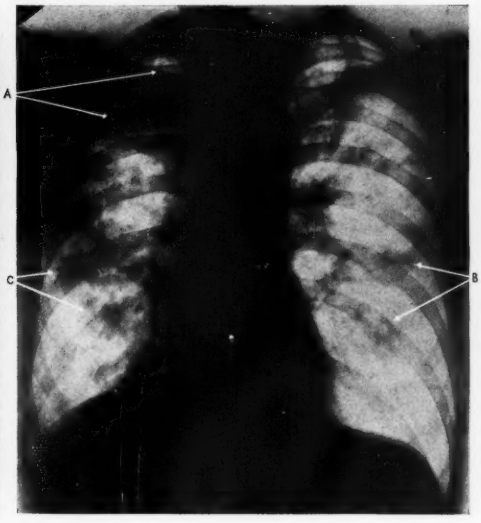

Fig. 6. Sept. 23, 1929. Same case as shown in Figure 5. At this time there is excavation in the right upper lobe *(A)*, cross-infection in the left lung *(B)*, and secondary infection *(C)*. In this case the secondary infection of the lower part of the right lung is more extensive than the cross-infection.

Avenue Hospital as a case of pulmonary abscess.

2-14-24: Roentgenogram shows tuberculous consolidation of the right upper lobe. In the center of the consolidation there is an excavation about the size of a quarter. This does not show. The rest of the lung is normal (Fig. 13).

3-3-24: Beginning consolidation in the left lung. This was not recognized at the time of original study. There is a slight peribronchial thickening in the right lower lobe, which remains constant for quite a period of time.

3-10-24: Only at this time was the cross-infection recognized. The right upper lobe is almost completely excavated (Fig. 14).

4-24-24: There is now, for the first time, peripheral involvement of the lower part of the right lung (Fig. 15).

5-13-24: Roentgenogram made postmortem shows practically complete involvement of both lungs (Fig. 16).

It is important to note that in both these cases the presence of cross-infection was not recognized until the lesion was of considerable size, although re-examination of the roentgenograms made previously showed that it had been present for more than three weeks in the first case, and for more than a week in the second case.

Case III.—A similar cross-infection was observed in a case of pulmonary gangrene involving the lower medial part of the right lung.

8-14-29: Roentgen examination on admission to the French Hospital was made (Fig. 17). Foul expectoration. Localized pneumonia quite characteristic of abscess. There are no discernible cavities.

9-6-29: There is extensive cavitation. Bronchopneumonia in the left lung, due to cross-infection (Fig. 18).

9-24-29: The pneumonia has disappeared. The destruction in the right lung has increased and there are two well defined cavities.

Fig. 7. Caseous pneumonia of right upper lobe in which cavitation has occurred *(A)*. Cross-infection of left lung *(B)*. Secondary infection *(C)*. In this case also the infection of the lower part of the right lung is more extensive and conglomerate than the cross-infection.

Fig. 8. Tuberculous pneumonia, with cavitation in right upper lobe *(A)*. Tuberculous bronchopneumonia (cross-infection) of left lower lobe *(B)*.

11-4-29: Roentgenogram shows healing; the former cavities have disappeared and their site is now shown only by two lines of scar tissue.

The question very naturally arises as to what the mechanical factors are which pro-

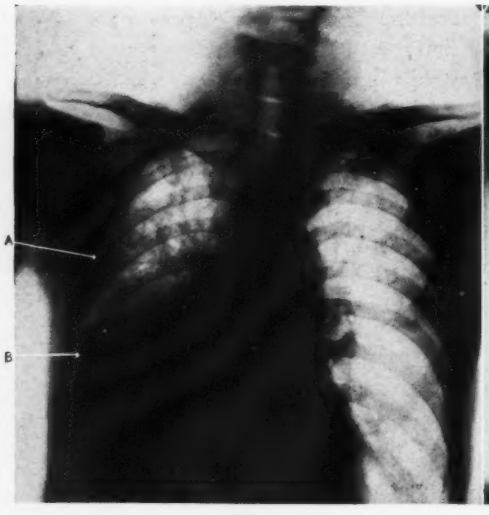

Fig. 9. Case I, April 10, 1929. Caseous pneumonia of right lower lobe *(A)*. Diffuse infiltration in right upper lobe *(B)*. At this time there is no cross-infection of the left lung.

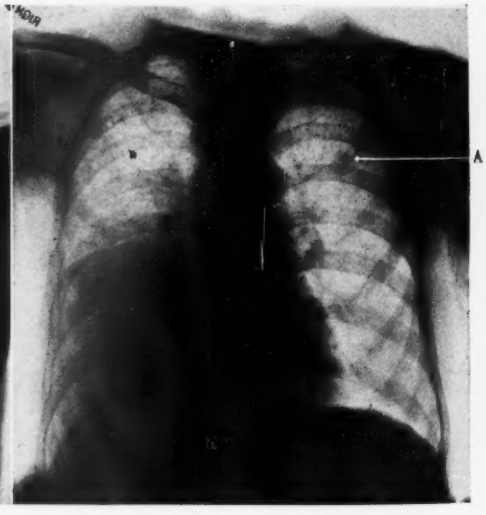

Fig. 10. Case I, April 17, 1929. At *(A)* there is a small area of cross-infection in the left lung. This involvement was not recognized when the films were originally studied.

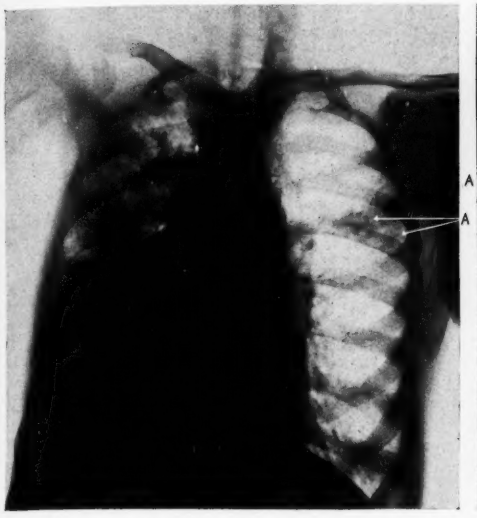

Fig. 11. Case I, June 3, 1929. At this time the area of cross-infection *(A)* was first recognized.

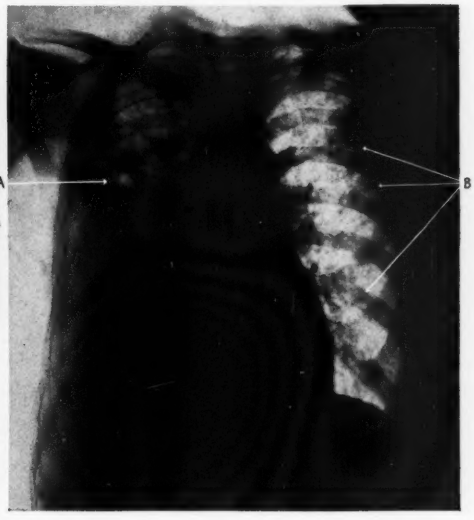

Fig. 12. Case I, July 11, 1929. Shows progressive involvement of the right upper lobe, with cavitation at *(A)*, and a very extensive involvement of the left lung *(B)*.

duce cross-infection and make the middle of the left lung the site of predilection. This part of the lung is in continuous line with the direction of the left main bronchus. It is quite probable, therefore, that material aspirated into this region follows the path of least resistance beyond the termination of the left main bronchus. The corollary is that

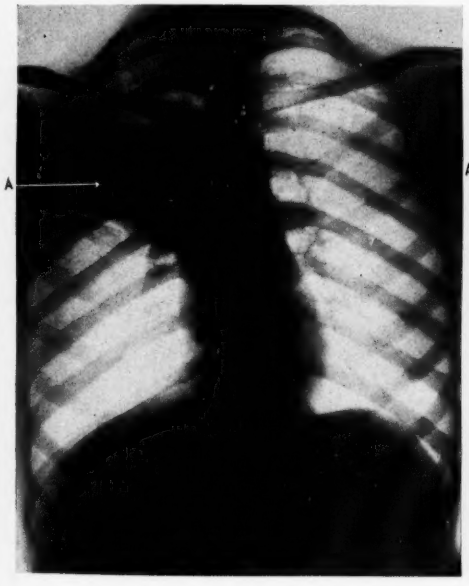

Fig. 13. Case II, Feb. 14, 1924. Tuberculous pneumonia of lower part of right upper lobe, with excavation at *(A)*, not shown.

Fig. 14. Case II, March 10, 1924. Almost complete excavation of right upper lobe *(A)*. Extensive cross-infection of left lung *(B)*.

Fig. 15. Case II, April 24, 1924. Excavation of right upper lobe *(A)*. Marked increase in involvement of left lung *(B)*. Peripheral involvement of the parenchyma in the right middle lobe *(C)*.

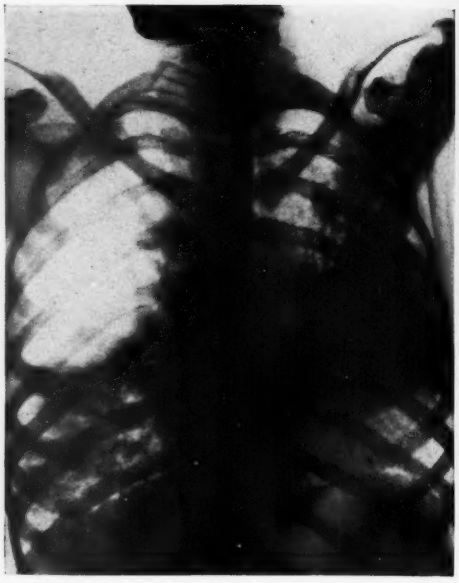

Fig. 16. Case II, May 13, 1924. Roentgenogram made postmortem. The lungs were inflated through a rubber tube inserted in the trachea.

this part of the left lung is the site of predilection because the bronchi supplying it are the most direct continuation of the left main bronchus.

This secondary lesion is usually peripherally situated and involves the parenchyma of the lungs. The infectious material must, therefore, be aspirated into the air vesicles proper. Prolonged maintenance of one posture, such as lying upon the left side during sleep, might give the opportunity for material to drain into the parenchyma of the lung. It seems more probable, however, that infectious material would collect in the bronchi and not in the air vesicles. Some added force is very likely necessary, such as is undoubtedly present in the act of coughing. The sharp inspiration which occurs after a prolonged cough or paroxysm of coughing is certainly forceful enough to drive into the parenchyma of the lungs exudate which is present in the bronchi.

Case IV.—That a viscid material present in one part of the lung may be displaced into the parenchyma of this site of predilection is very conclusively shown in the following roentgenograms, which were made before and after lipiodol had been instilled into the bronchial tree. These roentgenograms are of a woman, 38 years old, who had been suffering from a chronic, severe, dry cough for the past eighteen months. X-ray examinations have been made intermittently since October, 1928.

12-8-28: Roentgenogram shows an unusual pleural and pulmonary lesion on the right side, the exact nature of which has never been determined (Fig. 19).

9-30-29: Roentgenogram shows lipiodol to be present in the lower bronchi on the right side, and a very small amount in the lower bronchi on the left side. Note that no lipiodol is present in either the middle

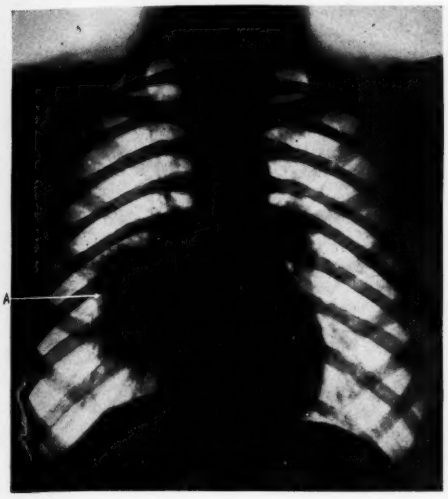

Fig. 17. Case III, August 14, 1929. Pulmonary gangrene *(A)*.

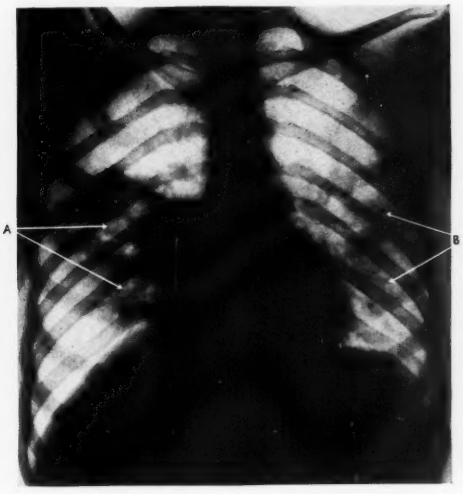

Fig. 18. Case III, Sept. 6, 1929. Cavities in gangrenous lung *(A)*. Cross-infection bronchopneumonia of left lung *(B)*.

of the left lung or the bronchi leading to this region (Fig. 20).

10-4-29: Roentgenogram (Fig. 21) made five days later than that shown in Figure 20, reveals lipiodol present in the parenchyma of the left lung, in the area which is the site of predilection in cross-infection. The next figure (Fig. 22) shows this local region photographed almost to actual size. In this, one can see the granular distribution of the lipiodol, which shows even more distinctly in the original film. This granular appearance is due to the presence of the lipiodol in the air vesicles proper.

It is our belief that the frequent severe cough from which this woman suffered was the principal mechanical factor in the displacement of the lipiodol into this part of the lung.

A similar cross-implantation of infection or foreign material also occurs from the left to the right lung, and the site of predilection is relatively the same. This has not been observed as frequently, probably because these destructive types of lesion occur originally more frequently on the right than on the left side. We have not as yet had an opportunity to follow the first development of a lesion in the right lung secondary to a destructive lesion in the left lung.

In the ordinary type of subacute pulmonary tuberculosis of the adult, the apices—above the second ribs—of both upper lobes are very frequently involved. The lesions in the two lungs may be relatively of the same age and distribution, or the lesion on one side may be very apparently of longer duration and more widespread than the lesion on the opposite side.

When the lesions are of different ages it is generally impossible to determine whether the younger infection is exogenous or an example of autogenous cross-infection. The usual conception has been that these are examples of autogenous cross-infection. In all the cases of destructive pulmonary lesions which we have closely followed, cross-infection has always developed in the part of the lungs projected between the second and fourth ribs in the roentgenogram. The evi-

Fig. 19. Case IV, Dec. 8, 1928. Pleural and pulmonary lesion *(A)* of unknown etiology. Roentgenogram made before lipiodol had been injected into the bronchi.

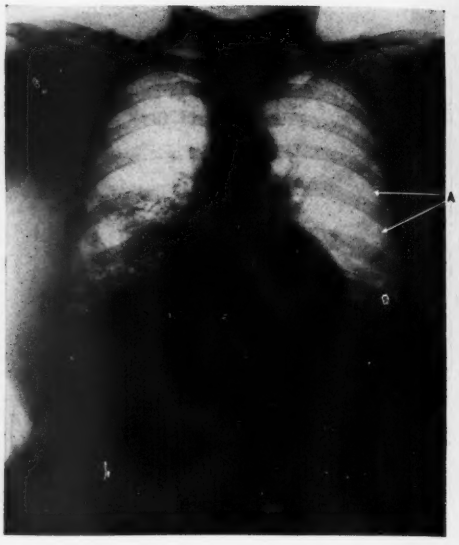

Fig. 20. Case IV, Sept. 30, 1929. Lipiodol is present in lower bronchi on both sides. Note that no lipiodol is present in either the middle of the left lung *(A)* or the bronchi leading to this region.

dence would, therefore, indicate that cross-infection to the apex is unusual.

SUMMARY

Cross-infection from the right to the left lung is apparently quite frequent in the presence of destructive infections of the right lung.

The site of predilection within which cross-infection usually develops is in the middle of the left lung, that part of the lung which is projected between the second and fourth ribs in the roentgenogram.

Cross-infection is apparently due to the aspiration of infectious exudate and detritus present in the bronchial tree.

That viscid material from some other part of the lungs may be aspirated into the parenchyma of this site of predilection is shown by the aspiration of lipiodol in the last case (Case IV).

The site of predilection is apparently in the path of least resistance beyond the termination of the left main bronchus.

Posture of the individual may be a factor in this type of aspiration infection, but it seems probable that the sharp intake of breath following a prolonged cough or paroxysm of coughing is a more important factor in driving secretions present in the smaller bronchi into the air vesicles proper.

Estimation of prognosis in any given case of pulmonary infection does not depend entirely upon the progress or retrogression of the original areas of infection, but must take into consideration whether or not there is secondary infection of other parts of the lung.

It has been our experience in closely following the progress of a pulmonary lesion that one's attention becomes fixed upon a certain region of the lung, since one is eager to detect evidence of progression or retrogression of the pathologic process. Yet, for this very reason, the development of a secondary lesion elsewhere in the lung is very

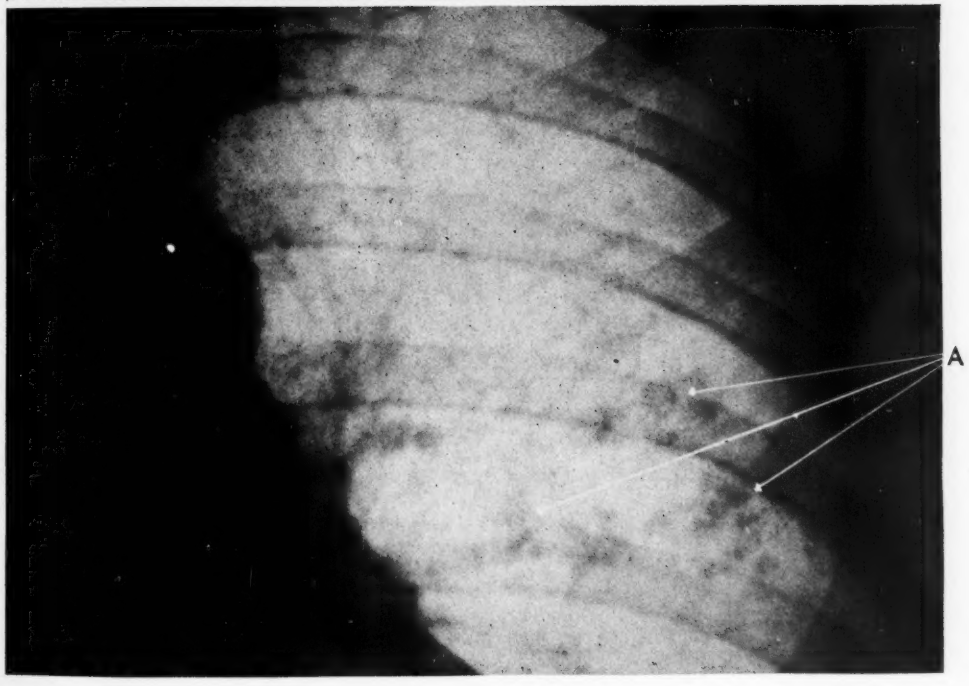

Fig. 21 *(above)*. Case IV, Oct. 4, 1929. Roentgenogram made five days later than that shown in Figure 20. At *(A)* lipiodol is present in the parenchyma of the left lung, in the area which is the site of predilection in cross-infection.

Fig. 22 *(below)*. Case IV, Oct. 4, 1929. Actual size reproduction of area *(A)* in left lung shown in Figure 21. In the area noted by the arrows one can observe the granular distribution of the lipiodol, due to its presence in the air vesicles proper.

apt to be overlooked until it is of considerable size.

Knowing that destructive types of infection have a definite tendency to cross-infection and that there is a site of predilection, that part of the lung which is the site of predilection should be studied in detail in the roentgenogram in order to detect at an early stage the development of secondary infection.

SINUSES (DIAGNOSIS)

Newer Methods of Visualizing Pathology of the Nasal Sinuses. Ernest W. Carpenter. Southern Med. and Surg., June, 1930, XCII, 428.

A large majority of all secondary infections are traceable to the respiratory tract for their origin. Too often a clinical survey is made by a cursory inspection of the parts, and if no pus is found, the study is reported as negative. A simple X-ray study is of value, but in borderline cases X-ray studies of the nasal sinuses are notoriously disappointing and misleading.

The use of lipiodol is of great value in visualizing the contents and patency of the various sinuses. The author injects one antrum at a time, using a 50 per cent dilution of the oil, injecting with a straight steel needle puncturing the inferior meatus. When oil begins to drop from the anterior nares, films are made in the upright position in two planes. The following queries will usually find some answer: (1) Are the ostia patent? (2) Do the sinuses fill normally or partially? (3) Is the outline of the opaque substance in contact with the bony wall? (4) Does the sinus empty normally?

Interpretation is not always easy and must be carefully made with anatomical peculiarities in mind.

W. W. Watkins, M.D.

The Roentgen-ray Diagnosis of Polypi of the Maxillary Antra. Howard P. Doub and Andrew R. McGee. Am. Jour. Surg., May, 1930, VIII, 1039.

The roentgen-ray examination of the maxillary antra is of particular value when searching for a hidden area of focal infection. In these cases polypi are frequently found and are disclosed either by the usual examination or by a pressure defect produced on a column of opaque medium injected into the antrum. These polypi are frequently the result of an inflammatory process of the antrum, and these, together with chronic thickening of the mucous membrane of the antrum, are undoubtedly the site of focal infection.

The introduction of lipiodol into the antra has opened up a new era in diagnosis, revealing pathology which was formerly imperfectly disclosed. A series of cases operated upon is reported, showing a very high percentage of correct diagnoses.

AN IMPROVED FORM OF STANDARD IONIZATION CHAMBER

By LAURISTON S. TAYLOR and GEORGE SINGER, WASHINGTON, D. C.

Abstract.—A modification of the open-air parallel plate ionization chamber, readily portable and adapted to field use, is described. In this chamber, narrow guard plates are supplemented by a system of ten guard wires across the ends of the chamber. The wires are so spaced that X-ray scattering from them is negligible. By this means a uniform electrostatic field between electrodes is obtained without the use of wide guard plates and the large plate-to-shield spacing necessary in the primary standard. This design has permitted a decrease in the volume and weight of the secondary standard by a factor of 15.

The results of direct comparisons between this chamber and the primary standard are given and indicate that the roentgen can be reproduced by the former with the same accuracy as the primary standard. The problem of diaphragming is identical for the two chambers, and for a given tube the same inverse power law holds for both. Like the standard chamber, the new chamber does not require that corrections be made for differences in X-ray quality.

Any of the usual electrostatic measuring systems may be used with this chamber, although for precise work a null or current compensation system is desirable.

It is expected that this type of chamber will be found useful in the international comparisons of the roentgen now pending, for which purpose the "fingerhutkammer" is generally inadequate.

I. INTRODUCTION

THE unit of quantity of an X-ray beam has been defined[1] in terms of "the ionization produced in 1 cubic centimeter of unrestricted atmospheric air"[2]; and as a result the air ionization chamber is, at least temporarily, established as the primary standard for X-ray intensity measurements.

Two distinct types of standard ionization chambers have been used: (*a*) The pressure air chamber, designed by Thaller[3] and by Behnken[4, 5] to give comparatively large ionization currents, measurable without the use of extremely sensitive instruments; (*b*) The atmospheric pressure air chamber, of which the construction and manipulation is comparatively simple. The first type was employed by the Physikalische-Technischen Reichsanstalt until their very recent adoption of a cylindrical form of atmospheric air chamber. In this country the second type has been used exclusively.

The atmospheric or open-air chamber was conceived as a result of Villard's definition of the "*e*" unit in 1908,[6] and was later developed by Friedrich.[7] As a result of further refinements by Duane,[8] Glasser,[9] Failla,[10] Küstner,[11, 12] the authors,[13, 14] and others, it is now apparently adequate for present demands. Using well-controlled, constant voltage on the X-ray tube, correct diaphragming of the X-ray beam and a refined measuring technic, the roentgen can be reproduced at the present time at the National Bureau of Standards with a mean deviation of about ± 0.5 per cent.[15]

1Second International Congress of Radiology, Stockholm, July 23 to 27, 1928.

2Paragraphs 2 and 3, "Report of International X-ray Unit Committee" (Recommended): "2. That this International Unit be the quantity of X-radiation which when the secondary electrons are fully utilized and the wall effect of the chamber is avoided, produces in 1 cubic centimeter of atmospheric air at 0° C. and 76 cm. mercury pressure such a degree of conductivity that one electrostatic unit of charge is measured at saturation current." (Recommended): "3. That the International Unit of X-radiation be called the 'Roentgen' and that it be designated by the small letter r."

3R. Thaller, O. Berg, and W. Schwerdfeger, Wissenschaftliche Veroffentlichungen aus dem Siemenskonzern, 1924, III, 162.

4H. Behnken, Zeit. fur Techn. Phys., 1924, V, 3.

5H. Behnken, Zeit. fur Techn. Phys., 1926, VII, 563.

6A. Villard, Arch. d'Elec. Med., 1908, p. 692.

7Kroenig and Friedrich, Radiation Therapy, 1922.

8W. Duane and E. Lorenz, Am. Jour. Roentgenol. and Rad. Ther., 1928, XIX, 461.

9O. Glasser and U. V. Portmann, Am. Jour. Roentgenol. and Rad. Ther., 1928, XIX, 47.

10G. Failla, Am. Jour. Roentgenol. and Rad. Ther., 1929, XXI, 47.

11H. Küstner, Phys. Ztschr., 1927, XXVIII, 797.

12H. Küstner, Strahlentherapie, 1928, XXVII, 331.

13L. S. Taylor, Bureau of Standards Journal of Research, 1929, II, 771.

14L. S. Taylor, Bureau of Standards Journal of Research, 1929, III, 807.

15L. S. Taylor, RADIOLOGY, June, 1930, XIV, 551.

It is not sufficient, however, that the unit be duplicable in any one laboratory, but there must be also good agreement between the units as determined by all standardization laboratories. In the establishment of several American and German laboratories and the Reichsanstalt. The only basis at present for agreement between the Bureau and the Reichsanstalt rests on a comparison recently made between the former and the

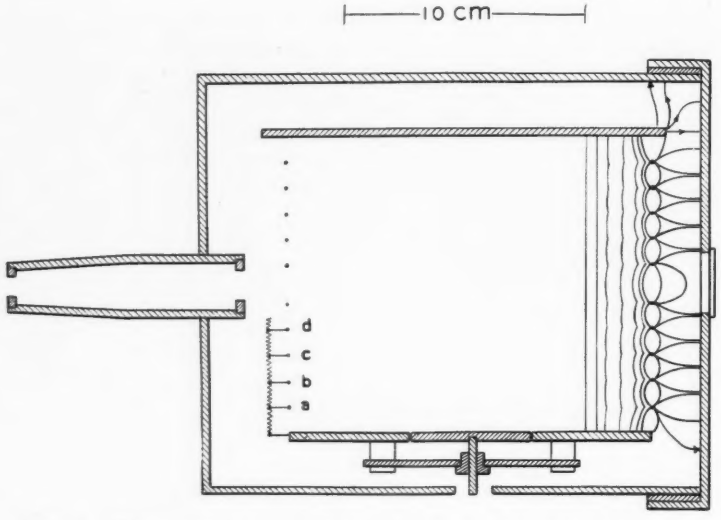

Fig. 1. Diagrammatic cross-section of ionization chamber showing some of the lines of force as affected by the guard wire system.

standards, it is obviously desirable to have them correct to one significant figure better than the magnitudes they are used to certify. Applied in the case of the international roentgen, if medical practice demands an accuracy of 5 per cent in the calibration of its ionometers, the national standardization centers should bring about an agreement, if possible, between their respective standards of 0.5 per cent. There has been as yet, however, no direct check of the roentgen between the national standardizing laboratories.

The only comparison of international character was made by Behnken[16] in 1927, before a standard was developed at the Bureau of Standards. He found at the time an agreement of about ±4 per cent between Cleveland Clinic which had been found to be within about 4 per cent of the Reichsanstalt.

Behnken's medium for transferring the unit was a carefully constructed ionometer with a magnesium thimble chamber and a uranium oxide auxiliary radiation standard for controlling its sensitivity. At that time this was the best known means for effecting such a comparison, but later work—particularly that of Braun and Küstner[17, 18] and this laboratory[19, 20]—has proved it to be inadequate for the high precision necessary. In a recent paper it was shown that while a thimble chamber ionometer is sufficiently ac-

16H. Behnken, Strahlentherapie, 1928, XXIX, 192.

17R. Braun and H. Küstner, Strahlentherapie, 1929, XXXII, 550.

18R. Braun and H. Küstner, Strahlentherapie, 1929, XXXII, 739.

19L. S. Taylor and G. Singer, Bureau of Standards Journal of Research (R. P. 169), 1930, IV, 631.

20L. S. Taylor, RADIOLOGY, June, 1930, XIV, 551.

curate for intensity measurements in X-ray therapy it is liable to errors due to such factors as the "wall effect,"[21] non-uniform distribution of ionization within the chamber, and the effective chamber length, all of which render such an instrument incapable of the precision attainable with the standard. If the various standards can not themselves be directly compared, the comparison instrument should have a precision at least as good as the standards.

With this problem of agreement in mind, at the time the present primary standard was being developed, efforts were also directed toward the design of a readily portable secondary standard, the accuracy of which would be equivalent to that of the primary.

II. CONSTRUCTION

In the design of a standard chamber, the fulfillment of certain necessary requirements renders the instrument large and heavy. For example, the plate spacing must be sufficient so that a negligible number of photo-electrons strike the plates, thus decreasing the amount of measured ionization produced by a given beam. Duane,[22] Failla,[23] and Glasser[24] found for a parallel plate ionization chamber with the beam passing centrally between the plates that a spacing of 10 cm. was sufficient. In order to permit the use of a wider beam of X-rays, the standard chamber here used has a plate spacing of 12 centimeters.

The width of the guard plates must be about one and one-half to two times the plate spacing for this type of chamber[25, 26] in order that there may be a perfectly parallel electric field across the whole width of the collector electrode. Thus, for a plate spacing of 12 cm., the guards must be about 20 cm. wide.

Also, if the plate system is to be inclosed

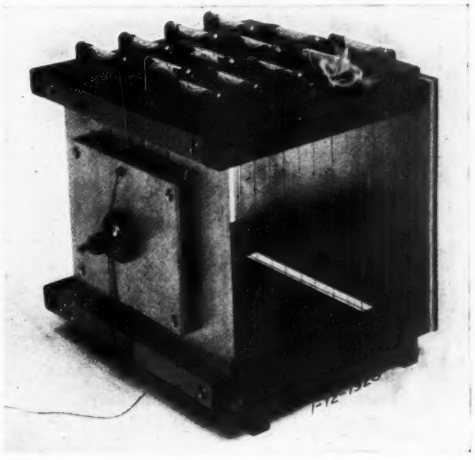

Fig. 2. Assembled electrode system showing guard wires and potential divider.

in a grounded metal box for electrostatic and X-ray shielding, the spacing between the charged plate and box must be at least that of the interplate spacing.

On account of these considerations the present standard chamber is necessarily very large and unwieldy. The cylindrical chamber used by Behnken is a little less so, but not enough to permit transportation and field use.

It has not been found possible heretofore to decrease either the interelectrode spacing or the spacing between the electrodes and the grounded case. However, by means of a guard wire system, it has been found possible for a plate spacing of 12 cm. to reduce the guard plate width from 18 to 5 cm. and, likewise, the distance between the high potential electrode and the grounded case from 12 to 3 centimeters.

This modified type of ionization chamber is shown diagrammatically in Figure 1,

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21 L. S. Taylor and G. Singer, see Footnote 19.
22 W. Duane and E. Lorenz, Am. Jour. Roentgenol. and Rad. Ther., 1928, XIX, 461.
23 G. Failla, Am. Jour. Roentgenol. and Rad. Ther., 1929, XXI, 47.
24 O. Glasser and U. V. Portmann, Am. Jour. Roentgenol. and Rad. Ther., 1929, XXI, 47.
25 G. Failla, Am. Jour. Roentgenol. and Rad. Ther., 1929, XXI, 47.
26 L. S. Taylor, Bureau of Standards Journal of Research, 1929, II, 771.

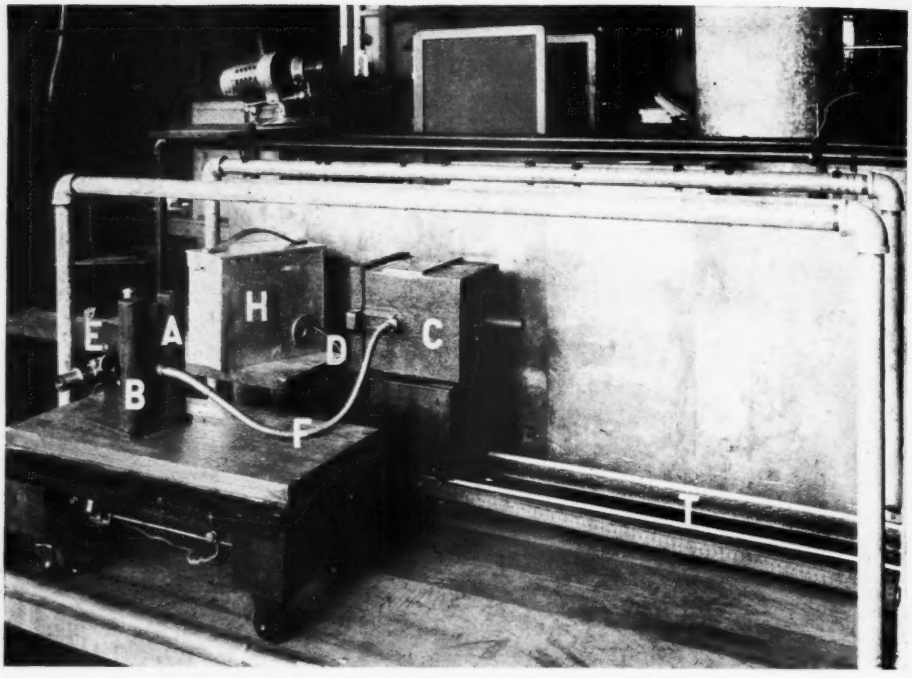


Fig. 3. Complete ionization chamber system, including electrometer, *E*, and high potential generator, *H*, mounted on track *T*, facing X-ray tube.

from which it is seen that the guard plates are relatively narrow and the wall spacing small; whereas, ordinarily, such narrow guard plates would be entirely inadequate to insure a parallel field at the center of the chamber.

The field is rendered parallel by placing ten small aluminum guard wires (*a, b, c,* - - -) across the ends of the chamber parallel to the electrodes and about 1.1 cm. apart, except for the center pair, which are spaced about 1.6 cm. apart. To each of these wires, beginning at the one nearest the guard, is applied a potential greater than that of the preceding wire by one-tenth the total voltage used to saturate the chamber. Thus, for 2,000 volts applied to the chamber, the wires (*a, b, c,* - - -) have potentials of 200, 400, 600, - - - volts. This is easily accomplished by a series of eleven one-half megohm resistors connected in series between the ground and the high potential plate, the successive guard wires connecting successive resistors.[27] The electric field is thereby corrected as sketched in Figure 1.

Common grid-leak resistors may be used for the potential divider, provided they remain essentially constant with respect to each other. Wire-wound half-megohm resistors are more reliable but require more space. The potential of each wire was carefully checked with an electrostatic voltmeter and found to have the proper value. A photograph of the assembled electrode system is shown in Figure 2. In this the resistors are mounted on a hard-rubber sheet and the wires spaced on hard-rubber rods, the surface leakage of this material

[27] This type of application of electrostatic shielding of the space between parallel plates at different potentials was first used by H. B. Brooks, who developed the idea in 1916 and applied it to the design of an attracted disk electrometer. C. Snow, Bureau of Standards Journal of Research (R. P. 17), 1928, I, 513.

being negligible compared with that of the resistors. One of the four hard-rubber spacer rods may be replaced by a high resistance graphite rod and this used as the potential divider. Such a device, however, renders the chamber less rugged.

The electrode system is completely surrounded by a lead box braced with brass where necessary. Although this surrounding case is only 3 cm. from the edges of the electrodes, this does not in any way affect the field within the chamber, since the potential wires provide sufficient field correction. Figure 3 shows this ionization chamber completely assembled, with a flexile cable to connect to the electrostatic measuring system.

The diaphragm system used with this is designed in accordance with that of the primary standard[28] and is held in place by a lead-lined tube which fastens to the front of the ionization chamber. The diameter of the limiting diaphragm is 0.8 cm., so that the direct beam passing through the chamber does not strike any of the guard wires. At the inner end of the lead tube is a diaphragm 1.2 cm. in diameter, which minimizes the effect of any radiation scattered from the front diaphragm and the lead walls. At the back of the chamber the beam passes out through a 3-cm. hole covered with a thin sheet of celluloid to eliminate air drafts.

The electrostatic measuring system is essentially the same as that used with the standard chamber and has been previously described in detail.[29] For field use, where

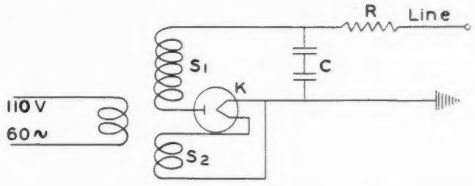


Fig. 4. Diagram of portable kenotron rectified 2,200-volt generator.

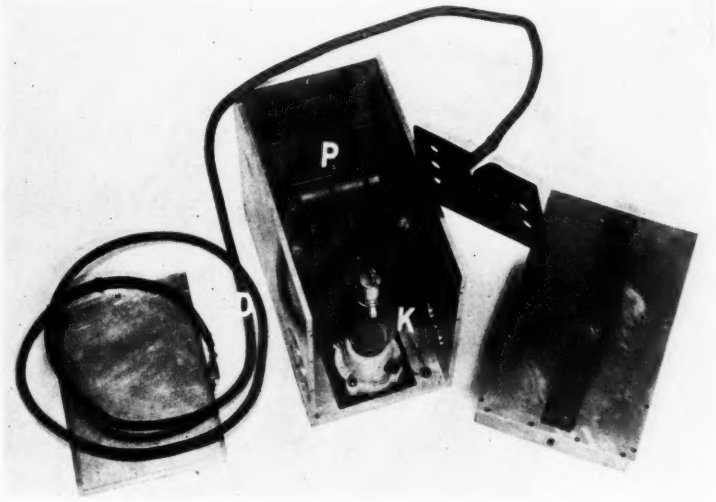


Fig. 5. Kenotron rectifier unit (2,200 volt D.C.), cut away to show construction.

[28] L. S. Taylor, Bureau of Standards Journal of Research, 1929, III, 807.

[29] L. S. Taylor. See Footnote 20.

the highest precision is not demanded, an idiostatic string electrometer system is used. The nature and magnitude of the error introduced through the use of this method have been previously investigated,[30] so that for the present needs the necessary correction can be made with fair exactitude. A portable idiostatic string electrometer, *E* (Fig. 3), is connected directly to the ionization chamber, *C*, by means of a flexible cable, *F*. *A* and *B* are concentric cylinder condensers used for changing the sensitivity of the measuring systems.[31]

The potential used to saturate the chamber is supplied from a compact portable kenotron rectifier shown in Figures 3 (*H*), 4, and 5. A low power 110-volt, 60-cycle transformer (*R*), specially built, is provided with two secondaries; S_1 to light the filament of a type H—1 kenotron *K* and S_2 to provide 1,550 volts rms which is rectified to give 2,200 volts direct current. In order to smooth out the rectified voltage, the capacitance, *C*, consisting of two 2 μf condensers in series, is inserted between the ground and the high side. A protective resistance, *R*, of several megohms prevents an accidental dangerous flow of current. The voltage is led to the chamber by means of a rubber-covered cable, *D* (Fig. 3), surrounded by a grounded copper "pigtail" sheath.

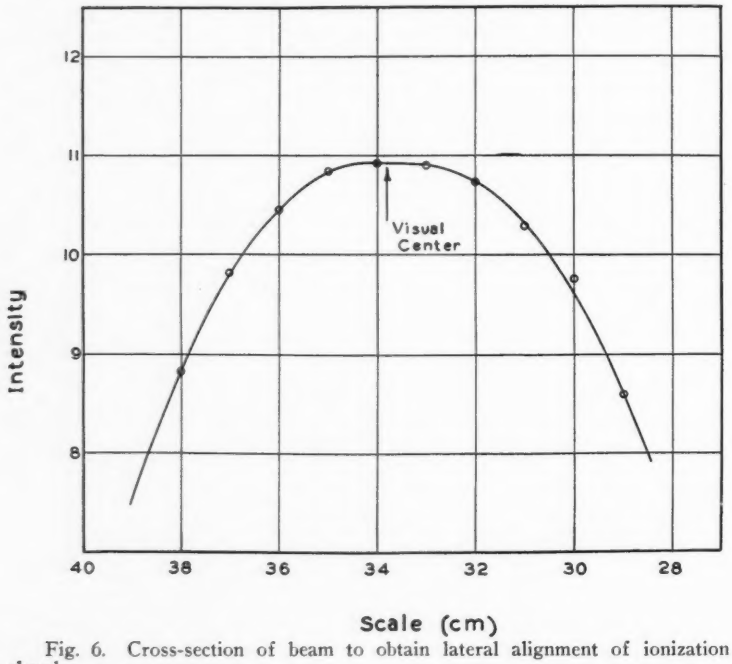


Fig. 6. Cross-section of beam to obtain lateral alignment of ionization chamber.

III. ADJUSTMENT AND ALIGNMENT

From the foregoing it is evident that the chamber closely resembles the standard

[30] L. S. Taylor. See Footnote 20.

[31] A current-balancing null system was first employed, using for this purpose a uranium oxide ionization chamber in which the ionization current was adjusted by a large iris diaphragm placed about 1 mm. from the uranium oxide covered plate. Since then Failla[32] and Jaeger[33] have devised better forms of ionization compensators; hence, it is planned in the future to use a radium-compensating chamber devised and very kindly furnished us by Dr. Failla. This system provides a wide range of currents and lends itself well to transportation, with unaltered calibration.

[32] G. Failla, RADIOLOGY, October, 1930, XV, 437 (seen in MS. form).

[33] R. Jaeger, Strahlentherapie, 1929, XXXIII, 542.

chamber already described.[34] This is highly desirable, since it makes the conditions of alignment and diaphragming identical for the two and consequently minimizes uncertainty due to corrections which must otherwise be made.

rely upon this method alone, particularly when used with a broad focus tube. In all cases ionization readings are made successively as the X-ray tube is shifted laterally in a direction at right-angles to the beam, and thus a measure of the intensity distribution

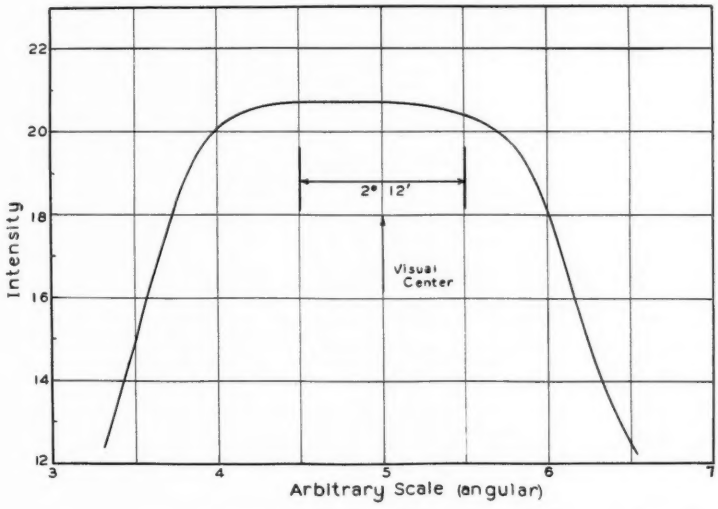


Fig. 7. Cross-section of beam to obtain angular alignment of ionization chamber.

As with the primary standard, the alignment with respect to the X-ray tube is fairly critical. For experimental test the chamber was mounted on a 2 m. track, T (Fig. 3), placed parallel to the X-ray beam and pivoted so as to rotate horizontally about its center. Lateral adjustment in the X-ray beam is effected by moving the X-ray tube. (For field use the chamber is mounted on a short track, providing the lateral motion.)

Preliminary visual alignment of the ionization chamber is made by sighting through the diaphragm system at the focal spot. This is facilitated by a cross-line marked on the celluloid window at the back of the chamber. With the small focus X-ray tube, such adjustment is fairly accurate, as shown in Figure 6, but it has been found unsafe to

[34] L. S. Taylor. See Footnotes 13 and 14.

across the beam is obtained. The final position of the chamber is that corresponding to the center of the intensity distribution peak. Likewise the chamber is tested for its angular alignment by measuring the ionization as it is rotated through a small angle about its center. Visual centering is more reliable in this case. Figure 7, showing the ionization intensity as the chamber is rotated, indicates the small range of adjustment possible; even with a fairly broad beam a rotation of over 1 degree in either direction will cause an error in the measurements.

For studying the behavior of this chamber, two X-ray tubes of the 200 K.V. Cooldige deep therapy type were employed. The first had a fine, very closely defined focal spot, while the second had a broad, poorly

defined focal spot with a "black center," these selections representing the two extremes ordinarily encountered in practice. Measurements with the standard chamber revealed a strict adherence to the inverse square law of intensity for the first tube and to the inverse 2.1 power for the second.

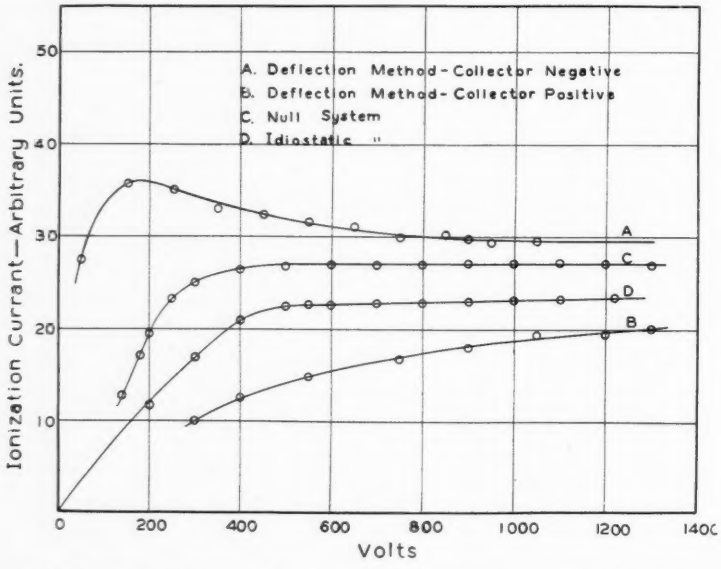


Fig. 8. Saturation curves for new ionization chamber as obtained by four methods. These are almost identical with saturation curves for the large standard chamber.

IV. PERFORMANCE

To be certain that the potential wires provided proper field correction, saturation conditions were studied as for the primary standard chamber; four different measuring methods were used, for which the saturation curves are shown in Figure 8. Curve *A* is for a system in which the collector plate is allowed to discharge to a potential below that of the guard electrodes; Curve *B* for a collector charging above the guard potential; Curve *D* for an idiostatic measurement, and *C* for a null compensation measurement. It is seen from these curves that the behavior is almost identical with that of the primary standard chamber using wide guard electrodes.[35]

The extent to which radiation was scattered from the diaphragms and potential wires was next investigated. A photographic film placed against the wires at the back of the chamber showed no shadow whatever of the wires after a long exposure with the aligned beam passing through the chamber. This indicates that scattering from the wires is negligible.

The second diaphragm used to reduce the effect of scattering from the limiting diaphragm is necessary as shown by the inverse square law curves (Fig. 9). Curve *A* shows, for the standard chamber, the logarithm of the intensity as a function of the logarithm of the distance measured between

[35] L. S. Taylor, see Footnote 13.

the focal spot of the broad focus tube and the front of the chamber diaphragm, which was set at the same diameter (0.8 cm.) as that of the secondary chamber under investigation. From the slope of this plot it is found that the intensity obeys the inverse 2.1 law. Repeating the same observations with the secondary standard, Curve *B* was obtained, showing a close parallel to the standard chamber within the experimental error. The scattering diaphragm, *S* (Fig. 1), was then removed from the back of the lead tube and, again repeating the run, Curve *C* was obtained, showing a marked divergence from the results obtained with the standard chamber. The need of the back diaphragm, *S*, is thus clearly evident.

The observations were next repeated, using the fine focus instead of the broad focus tube. Curve *D* for the primary standard chamber shows a strict adherence to the inverse square law, and likewise Curve *E* for the secondary standard—the two curves agreeing within experimental error.

The final measure of accuracy obtainable with the chamber is by a direct comparison with the primary standard chamber. To rule out any differences in the two electrometer systems for preliminary measurements, the same electrometer and compensating system was used for both chambers without necessitating any changes whatever in either the system or its connections. Both chambers were charged by the same source of high potential; in making observations, it was necessary only to shift the tube from one chamber to the other—a matter of about half a minute.

The effect of altering the size of the limiting diaphragm next to the X-ray tube was investigated, maintaining both chambers at the fixed distance of 75 cm. from the target. These data show that the two chambers fluctuate in the same manner, due to the uneven

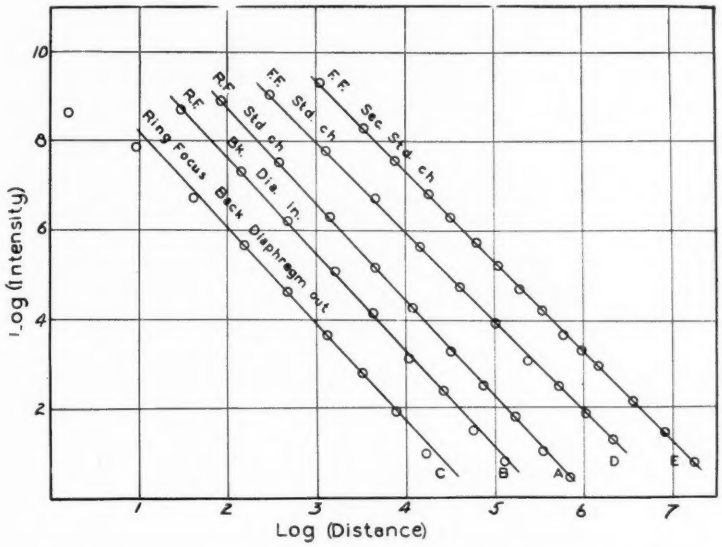


Fig. 9. Inverse square law curves for primary and secondary standard chambers. Logarithms shown are only to give slope and do not apply directly to the experimental points shown.

TABLE I

Diameter of tube diaphragm	r/min. primary standard	Deviation	r/min. small standard	Deviation	Difference
1	2	3	4	5	6
		Per cent		Per cent	Per cent
20	33.1	±0.2	32.6	±0.4	—0.7
18	32.8	.2	32.8	.1	.0
16	32.8	.3	33.0	.1	+.3
14	32.6	.2	32.6	.5	.0
12	31.6	.2	31.6	.3	.0
10	30.0	.2	30.4	.3	+.6
8	24.2	.2	24.3	.2	+.2
6	18.8	.2	18.6	.0	—.5
4	9.9	.2	9.9	.1	.0
Average difference					±.26

TABLE II

Primary standard			Secondary standard			
Tube distance	Chamber diaphragm	r/min.	Tube distance	Chamber diaphragm	r/min.	Disagreement
cm.	cm.		cm.	cm.		Per cent
94.5	0.8	14.00	94.5	0.8	14.25	±0.8
94.5	.8	5.24	94.5	.8	5.26	±.2
87.2	.8	6.23	87.2	.8	6.18	±.4

distribution of energy over the focal spot and off-focus radiation.[36]

Table I summarizes the data obtained. Column 2 gives the r/min. measured with the primary standard chamber and Column 3 the percentage mean deviation of the observations made for each point. Likewise Columns 4 and 5 give, respectively, the r/min. and the mean deviation of observations made with the secondary chamber. Column 6 shows the percentage agreement in the r/min. as measured with the two chambers, indicating that, in general, the agreement is within the observational error. All of the measurements thus far have been made with the same null electrostatic measuring system.

The final check was made using two entirely separate electrostatic current measuring systems. A few of the measurements taken under random conditions are shown in Table II, which needs no explanation.

[36] L. S. Taylor, Bureau of Standards Journal of Research, 1929, III, 807.

SKIN REACTIONS FOLLOWING EXPOSURE TO ROENTGEN RAYS

II. A STUDY OF THE EFFECT OF GRADED DOSES OF TWO DIFFERENT WAVE LENGTHS ON THE SKIN OF RATS

By ERNST A. POHLE, M.D., PH.D., F.A.C.R., and C. H. BUNTING, M.D., Professor of Radiology and Professor of Pathology, respectively, University of Wisconsin Medical School, MADISON, WISCONSIN

IN the discussion which followed the presentation of the first paper[1] in this series (1), clinical observations were mentioned which seemed to bear out our conclusions based on the histological changes noted in the skin of rats after exposure to roentgen rays of long wave length (1–2 Ångströms). Very recently, there have appeared reports of cases which have shown late reactions such as atrophy of the skin and telangiectasis following treatment with the so-called Grenz rays (2). This fact and also the enormous variations which exist between the "erythema dose" for X-rays of long wave length[2] induced us to continue our investigations and compare the macroscopic and microscopic reactions to graded doses of ordinary roentgen rays and roentgen rays of long wave length in the skin of rats.

METHOD

Male adult rats of the same strain were used and irradiated according to the same procedure as outlined in detail in the first paper (*l.c.*, p. 499). The following two types of radiation in fields of 2 cm. × 1 cm. area on the back of the animals were employed:

(1) *Upper field.*—Seven K.V., 5 ma., 5 cm. window-to-skin distance, lambda effective 2.0 Ångströms (measured through 0.1 mm. Al), strength of the beam equal to 1.3 r per second.[3]

Apparatus.—Transformer without rectifier, Muller type tube with Lindemann window and water cooling pump.

(2) *Lower field.*—Sixty K.V., 4 ma., 20 cm. F.S.D., 2.4 r per second; lambda effective 0.6 Ångström (measured through 2.0 mm. Al).

Apparatus.—Valve tube rectifier with condenser; Metalix water-cooled therapy tube.

The doses applied were chosen as follows: 500 r, 750 r, 1,000 r, 1,250 r, 1,500 r, 2,000 r, and 2,400 r. After intervals of 7, 10, 14, 30, 60, and 90 days, the rats were killed and the skin specimens prepared for microscopic examination.

EXPERIMENTS

The macroscopic and microscopic findings will be recorded here, accompanied by a number of selected illustrations, since it is not possible to reproduce all material photographically in each group, *i.e.*, both for the same doses and for the same interval following the exposure. Two or three rats were used in each instance in order to allow for individual variations. The following report is based on a total of over eighty animals.

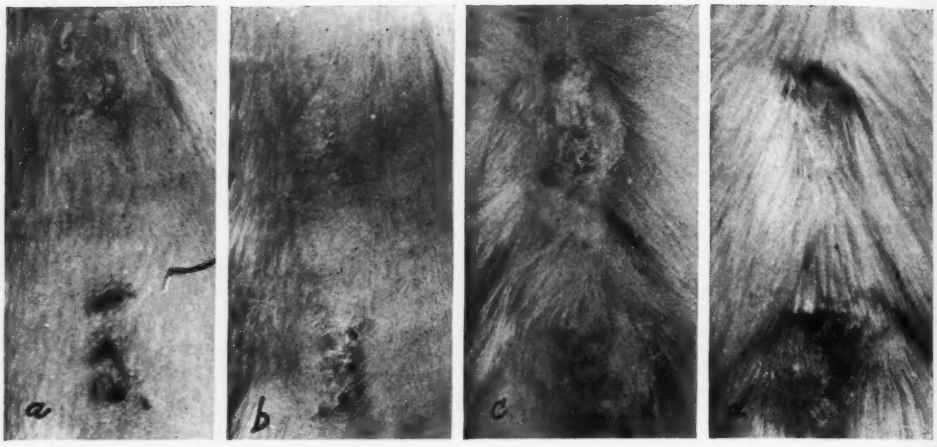
I. Exposure to 500 r (7 Days).—No macroscopic reaction. Microscopically, both lower and upper fields show very slight changes. There is some swelling of the epithelial cells and dilatation of the capillaries in the upper field.

(10 Days).—The upper field is essentially the same as at the seven-day interval. The lower field shows some thinning out of the

[1] Read before the Section on Radiology of the American Medical Association in Portland, Oregon, July, 1929.

[2] According to the literature, it varies from 250 r to 1,400 r.

[3] The r-unit used here is identical with that of the Bureau of Standards, Washington, D. C.



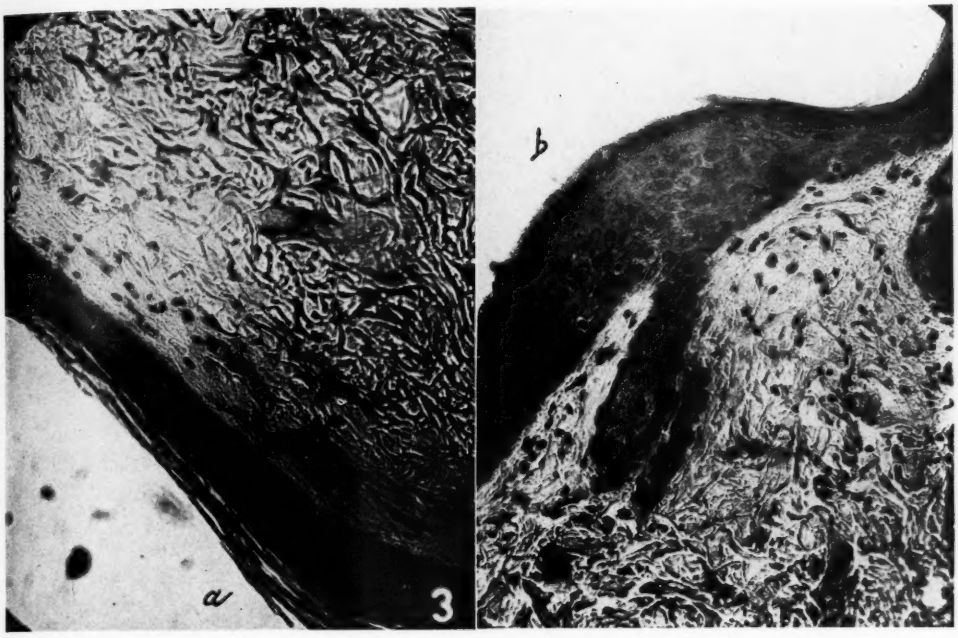
Figs. 1-*A*, 1-*B*, 1-*C*, and 1-*D*. Twelve hundred fifty r. Upper field, 7 K.V.; lower field, 60 K.V. 1-*A*, 14 days; 1-*B*, 30 days; 1-*C*, 60 days; 1-*D*, 90 days.

epithelium and a cellular exudate in the corium, with some increase in fibroblasts.

(14 Days).—In the upper field, the deeper vessels are dilated; capillary walls swollen. The lower field is essentially the same as at the ten-day interval except for a congestion of the subcutaneous vessels.

(30 Days).—No change in the upper field

Figs. 2-*A* and 2-*B*. Twelve hundred fifty r. Fourteen days. 2-*A*, upper field; 2-*B*, lower field.



Figs. 3-*A* and 3-*B*. Twelve hundred fifty r. Thirty days. 3-*A*, upper field; 3-*B*, lower field.

except for slight thickening of capillary walls.[4] In the lower field, the epithelium is thin and there is proliferation of endothelium in the capillaries.

II. Exposure to 750 r (7 Days).—No macroscopic reaction. In the upper field, there is swelling and vacuolation of epithelial cells; lymphocytes and a few fibroblasts in corium. Slight swelling of capillary walls and dilatation of deeper vessels. The epithelium of the lower field is thin, nuclei swollen; separation of cells; lymphocytes in corium and epithelial layer; deep vessels slightly dilated.

(10 Days).—Upper and lower fields are essentially the same as at the seven-day interval.

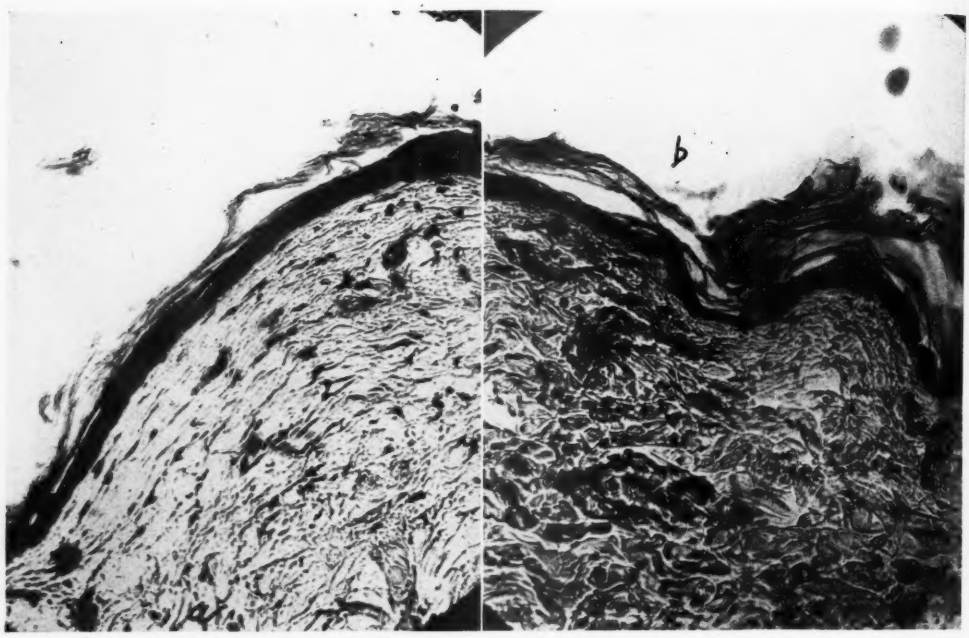
(14 Days).—In one rat, the outline of the fields appears faintly visible. In the upper field, the epithelium is thickened; lymphocytes in epithelium and corium; few fibroblasts in corium. There are slight capillary changes in the lower field; the epithelium is thin, nuclei of cells are shrunken; numerous lymphocytes in corium; congestion of deep vessels.

(30 Days).—In the upper field, the epithelium is thin and shows mitotic figures, capillaries normal, few fibroblasts in corium. Epithelium in the lower field appears normal. The walls of the capillaries are thickened; few lymphocytes or fibroblasts present.

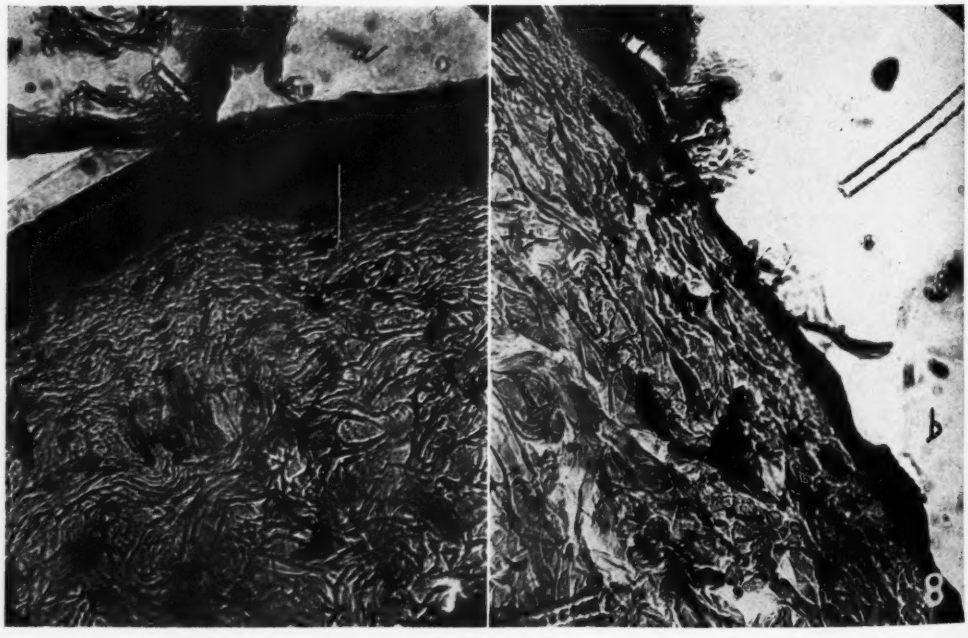
III. Exposure to 1,000 r (7 Days).—No macroscopic reaction. The microscopic changes are very similar to those observed in the second group in the same interval.

(10 Days).—Macroscopically, the fields begin to outline. In the upper field, there is swelling and vacuolation of epithelial cells, with lymphocytes in corium; swelling of capillary walls, with dilatation of the subcutaneous vessels. In the lower field, the

[4]The term "thickening of the capillary walls" is used to designate what appears to be a colloid swelling of the reticulum serving as a basement membrane for the endothelium.



Figs. 4-*A* and 4-*B*. Twelve hundred fifty r. Sixty days. 4-*A*, upper field; 4-*B*, lower field.



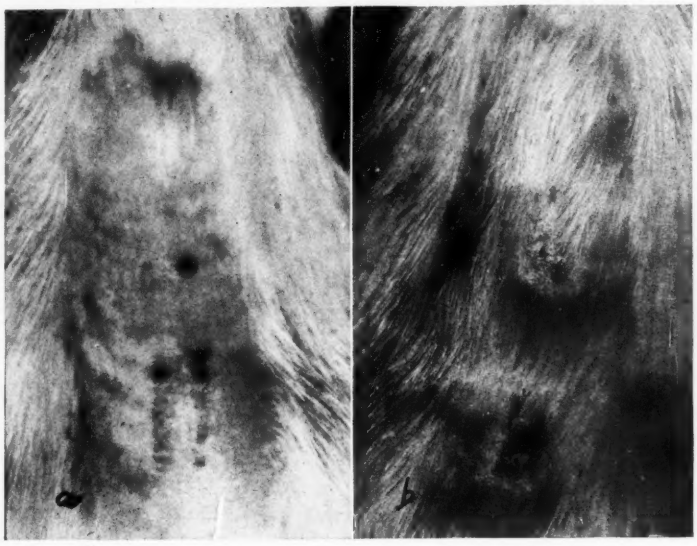
Figs. 5-*A* and 5-*B*. Twelve hundred fifty r. Ninety days. 5-*A*, upper field; 5-*B*, lower field.

epithelium is thin and the nuclei of the cells are swollen. There are lymphocytes in epithelium and corium; slight dilatation of blood vessels.

(14 Days).—Both upper and lower fields are definitely visible, with a slight preponderance of the lower area. Microscopically, there are no marked changes from the picture seen at the end of the ten-day period except for evidence of epilation in both fields.

(30 Days).—Macroscopically, both fields are still partly epilated, with fine hair growing in several areas. There is slight thickening of the epithelium in the upper field, with mitotic figures. Some lymphoid infiltration in corium and increase in fibroblasts. In the lower field, the epithelium is somewhat less thickened but shows mitotic figures; in some cases, the capillary walls are still swollen and the hair follicles are decreased in number; some hair shafts show atrophy.

IV. Exposure to 1,250 r (7 Days).—Macroscopically, both fields are faintly outlined, the upper with slightly more definiteness. Microscopically, the epithelium in the upper field is thin and, in the lower layer, the cells are separated; lymphocytic infiltration of epithelium and corium; capillary lumen small; walls thick. The changes in the lower field are essentially the same but of a lesser degree.



Figs. 6-*A* and 6-*B*. Fifteen hundred r. Upper field, 7 K.V.; lower field, 60 K.V. 6-*A*, 14 days; 6-*B*, 30 days.

(10 Days).—Outline of upper and lower fields becoming more definite. Epithelium in upper field not thickened, irregular; cells vacuolated, with large nuclei; occasional hyaline necrosis of cells; lymphocytes in epithelium and corium; capillary walls thickened; hair shafts atrophic. The epithelium in the lower field is slightly thickened, with mitosis present. Otherwise, the same changes as in upper area.

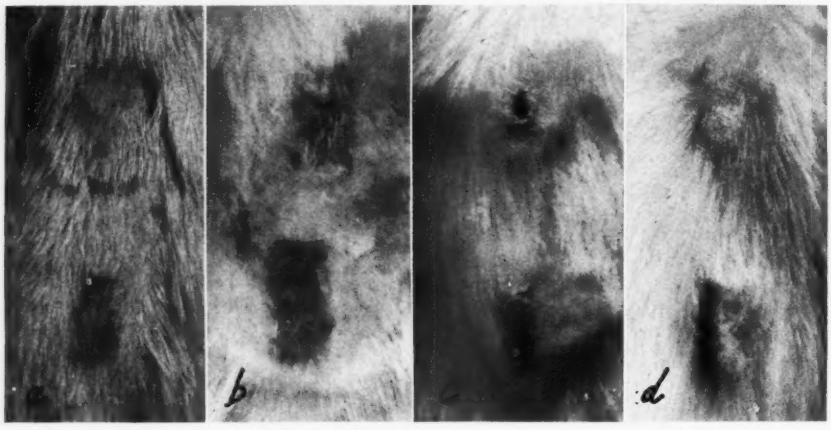
(14 Days).—Both fields show desquamation, with an occasional scab within the upper field and a few erosions in the lower

field. Epilation started (Fig. 1-*A*). Microscopically, the epithelium in the upper field is thick, with slight underlying fibroblastic proliferation; numerous lymphocytes in corium; slight thickening of capillary walls; hair shafts atrophic. The lower field shows similar changes, with beginning ulceration in spots (Fig. 2).

(30 Days).—Both areas are desquamated; a small scab in the lower field; both are partially epilated (Fig. 1-*B*). There is some thickening of epithelium in the upper area, with fibroblasts and lymphocytes in corium; absence or atrophy of hair shafts. In the lower field, there is heavy epithelial growth, with atrophic hair shafts; capillary walls swollen and thick (Fig. 3).

(60 Days).—The upper area is still epilated and shows pigmentation; the lower area is of a more bluish-white color. There is fine hair growing in both fields (Fig. 1-*C*). Microscopically, the upper area shows definite evidence of a small healed ulcer, with atrophic hair follicles; capillaries swollen, thick. The epithelium of the lower field is thin; no evidence of definite scar; capillaries small, walls thickened, hair shafts atrophic (Fig. 4).

(90 Days).—In both fields, the hair is regrowing; pigmentation in the upper area (Fig. 1-*D*). Microscopically, the epithelium in the upper field is thickened; lymphocytes in epithelium, with scar tissue underneath. In the lower field, a thin layer of epithelium overlies a scar; capillary walls are thick; hair shafts atrophic (Fig. 5).



Figs. 7-*A*, 7-*B*, 7-*C*, and 7-*D*. Two thousand r. Upper field, 7 K.V.; lower field, 60 K.V. 7-*A*, 10 days; 7-*B*, 14 days; 7-*C*, 30 days; 7-*D*, 90 days.

V. Exposure to 1,500 r (7 Days).—The outline of the upper field is faintly visible, lower questionable. Microscopically, there is swelling of the epithelium in the upper area, with mitotic figures. Lymphocytes in epithelium and corium; slight swelling of capillary walls. The epithelial changes in the lower field are essentially the same; there is slight dilatation of the deep vessels.

(10 Days).—A reaction is visible in both areas, more pronounced in the upper. Microscopically, the epithelium of the upper area is thin, slightly irregular, with pyknotic nuclei; some lymphocytes in epithelium. In the lower field, the epithelium is atrophic; few lymphocytes in corium; deep vessels congested.

(14 Days).—Both areas are desquamated; beginning ulceration in spots in both

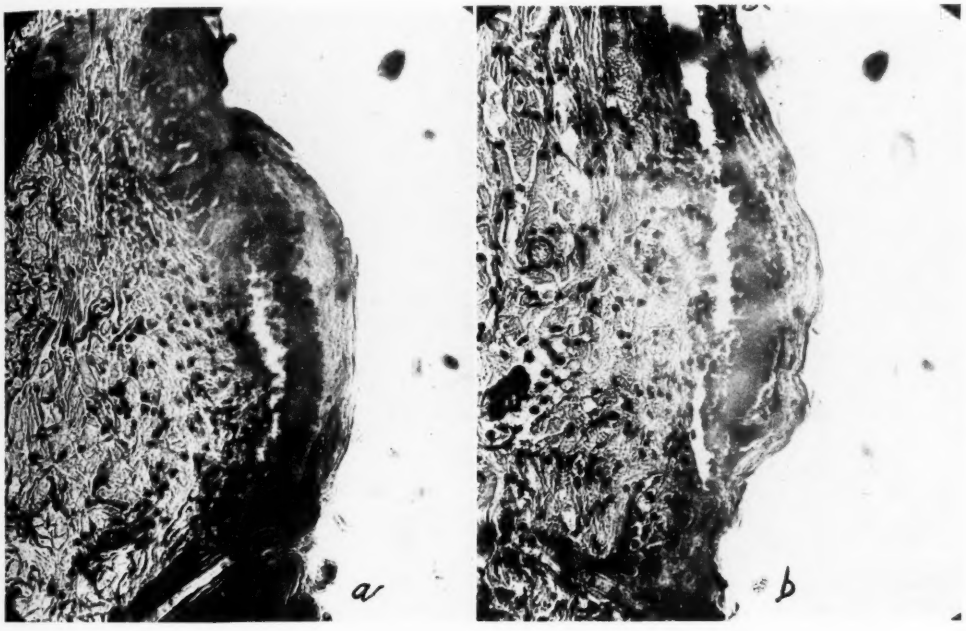
fields (Fig. 6-*A*). Microscopically, the epithelial layer in the upper field is thickened and shows numerous mitoses. There is proliferation of hair shaft epithelium; lymphocytes and fibroblasts in corium; capillaries and deep vessels much dilated. In the lower field, the epithelium is thin, somewhat irregular; cells occasionally swollen; lymphocytes in corium in groups; some endothelial proliferation of the capillaries.

(30 Days).—Both areas are epilated and show a moderate amount of desquamation. Crusts in spots in both fields, more in the lower (Fig. 6-*B*). In the upper area, the epithelium is thickened, irregular, with mitosis and invasion by lymphocytes, fibroblasts, and eosinophiles in corium; capillaries dilated; walls thin; hair shafts almost absent; some proliferation in few remaining shafts. The microscopic picture of the lower field is very similar.

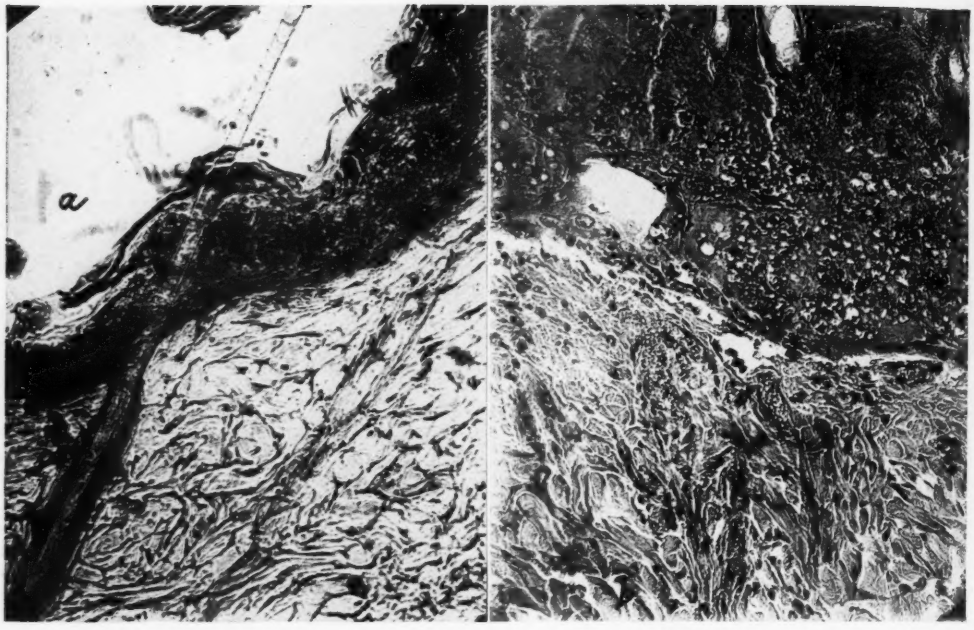
The findings at the 60-day and 90-day periods do not deviate much from those in Group IV.

VI. Exposure to 2,000 r (7 Days).—The outlines of both fields begin to appear. Microscopically, the epithelium in the upper field is slightly thickened; numerous mitoses; many lymphocytes in corium; capillary walls swollen; hair shafts show atrophy. There is nuclear proliferation. The changes in the lower field are similar, but not quite so striking.

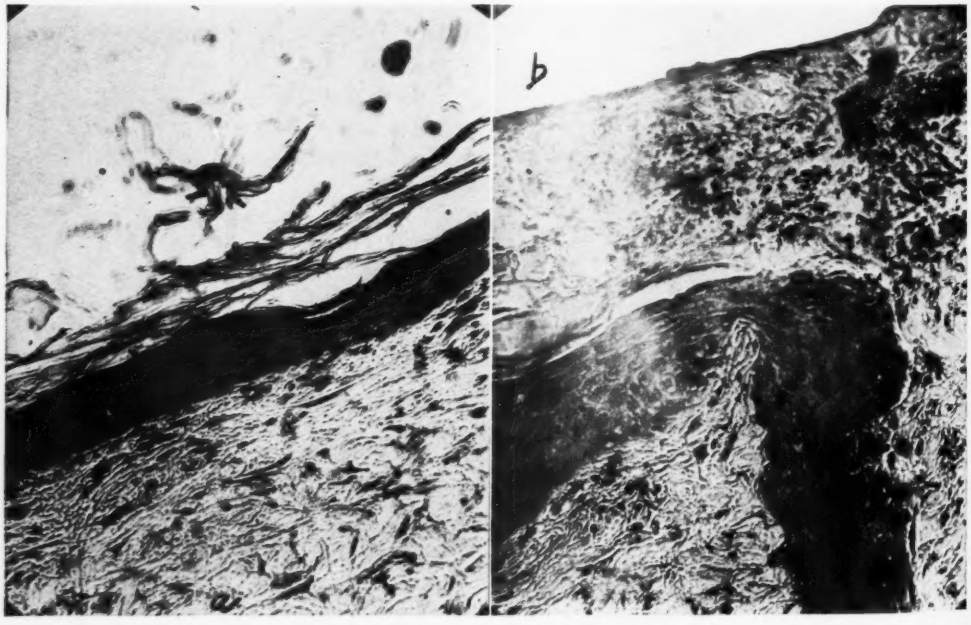
(10 Days).—Both fields are definitely outlined; beginning epilation; erosion in spots in both areas (Fig. 7-*A*). Microscopically, the epithelium in the upper area is thin; cells swollen, with large nuclei; occasional hyaline necrosis; lymphocytic infiltration of corium; capillary walls thickened. The epithelium in the lower field is thin, with some



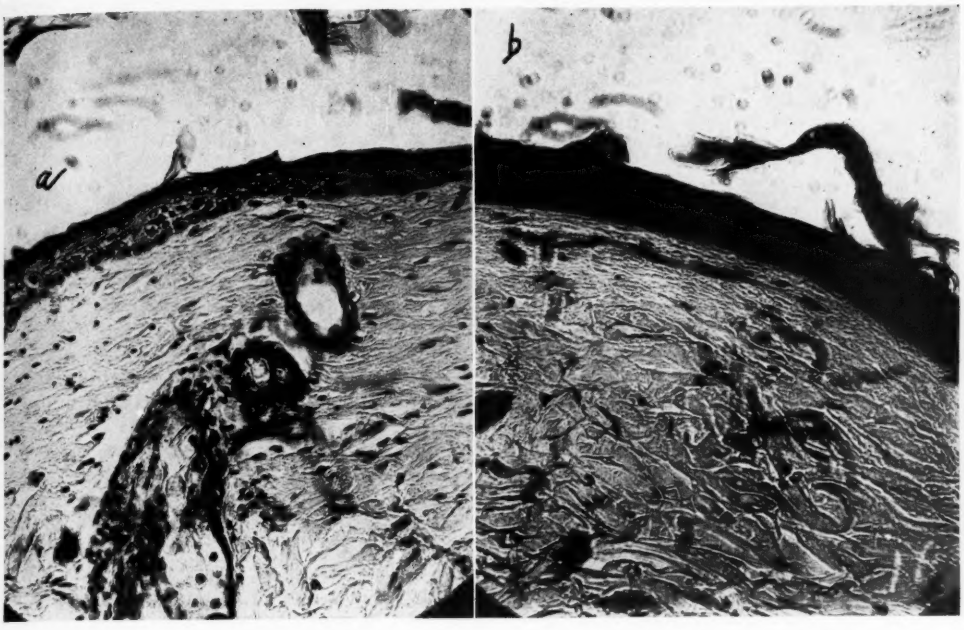
Figs. 8-*A* and 8-*B*. Two thousand r. Ten days. 8-*A*, upper field; 8-*B*, lower field.



Figs. 9-*A* and 9-*B*. Two thousand r. Fourteen days. 9-*A*, upper field; 9-*B*, lower field.



Figs. 10-*A* and 10-*B*. Two thousand r. Thirty days. 10-*A*, upper field; 10-*B*, lower field.



Figs. 11-*A* and 11-*B*. Two thousand r. Ninety days. 11-*A*, upper field; 11-*B*, lower field.

hypertrophy around edges, otherwise similar to the upper area. In some sections, beginning ulceration in both fields (Fig. 8).

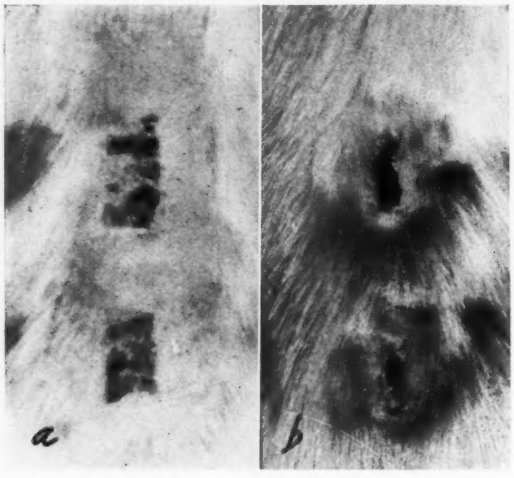
(14 Days).—Ulcer has developed in both areas, more extensive in the lower field (Fig. 7-*B*). Microscopically, there is an ulcer in the upper area, with leukocytic reaction; inflammatory dilatation of the blood vessels; epithelium around edge swollen, with large nuclei and mitoses. It is invaded by lymphocytes and separated from corium by lymphocytes. Hair shafts atrophic, many absent. In the lower field, the epithelium is thick, with irregular cells. Large swollen nuclei and lymphocytes in epithelium and corium. Ulcer (Fig. 9).

(30 Days).—The ulcers in both fields are healing; they are epilated (Fig. 7-*C*). Microscopically, the epithelium in the upper field is slightly thickened, with numerous mitoses; some infiltration of lymphocytes in corium. In the lower area, the epithelium is hyperplastic, with mitoses; several small ulcers; fibroblastic proliferation; hair shafts atrophic or absent in both fields (Fig. 10).

(60 Days).—Both fields are epilated and show pigmentation in spots. Microscopically, the epithelium in the upper area is thickened and there is slight fibroblastic reaction; hair shafts lacking; lymphocytes and leukocytes in epithelium and corium. The appearance of the lower area is similar to that of the upper.

(90 Days).—Both fields epilated, with slight desquamation, and fine hair regrowing in a few spots (Fig. 7-*D*). Microscopically, the epithelium in the upper area is thickened, cells crowded, mitotic; slight lymphocytic infiltration in epithelium and corium, also fibroblasts in corium; few atrophic hair shafts visible. The lower field has not changed much as compared with the sixty-day interval. The epithelium is thickened, also the capillary walls. Both fields present the picture of a definite scar (Fig. 11).

VII. Exposure to 2,400 r (7 Days).—Both fields are faintly outlined, the upper more distinctly. Microscopically, the epithelium in the upper area is thin, with large lobed nuclei; proliferation on edge of field; Lower layer of cells swollen and separated; leukocytic exudate on top of epithelium; capillaries show inflammatory dilatation; slight fibroblastic proliferation; epithelium on edge of section thickened; mitosis;



Figs. 12-*A* and 12-*B* Twenty-four hundred r. Upper field, 7 K.V.; lower field, 60 K.V. 12-*A*, 14 days; 12-*B*, 30 days.

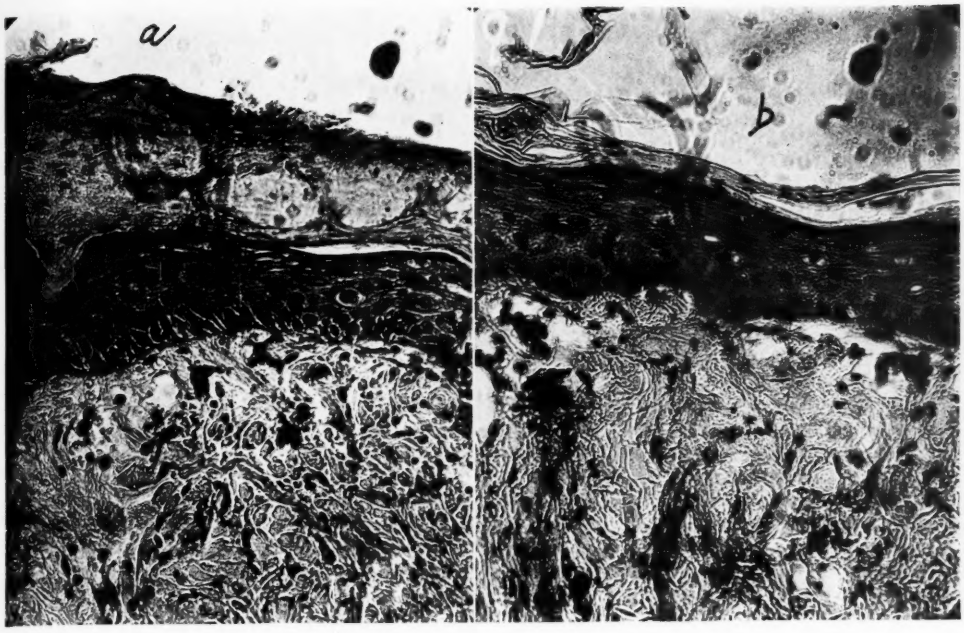
lymphocytes and occasionally leukocytes in corium; slight swelling of capillary walls. In the lower area, the epithelial cells are swollen, with large nuclei; direct division of some nuclei; lymphocytic and leukocytic invasion; hair shafts atrophic; capillary walls slightly thickened.

(10 Days).—Both areas show definite reaction. Microscopically, the epithelium in the upper area is thin; mitosis; few lymphocytes; capillaries slightly swollen; hair shafts slightly atrophic. The epithelium in the lower field is slightly thickened; capillaries dilated, with thickened walls; some lymphocytes; hair shafts atrophic.

(14 Days).—The ulcers are well developed in both areas, perhaps more pronounced in the upper field (Fig. 12-*A*). Epithelium thinned in center of upper area. lymphocytes in corium. In the lower field, the epithelium is thick and invasive; hair shaft epithelium proliferative; lymphocytes and fibroblasts in corium; capillaries swollen. In a number of sections, definite ulcer in both fields (Fig. 13).

(30 Days).—Both areas are epilated. The ulcers have partly healed, with a smooth scar showing desquamation; in spots they are covered by crusts (Fig. 12-*B*). In the upper area, the epithelial layer is thick; mitosis; underlying fibroblastic proliferation; few lymphocytes in corium; scar tissue throughout section. The lower field shows essentially the same microscopic picture, the scar not quite so extensive as in the upper area (Fig. 14).

(60 and 90 Days).—Both macroscopic and microscopic findings are essentially the same

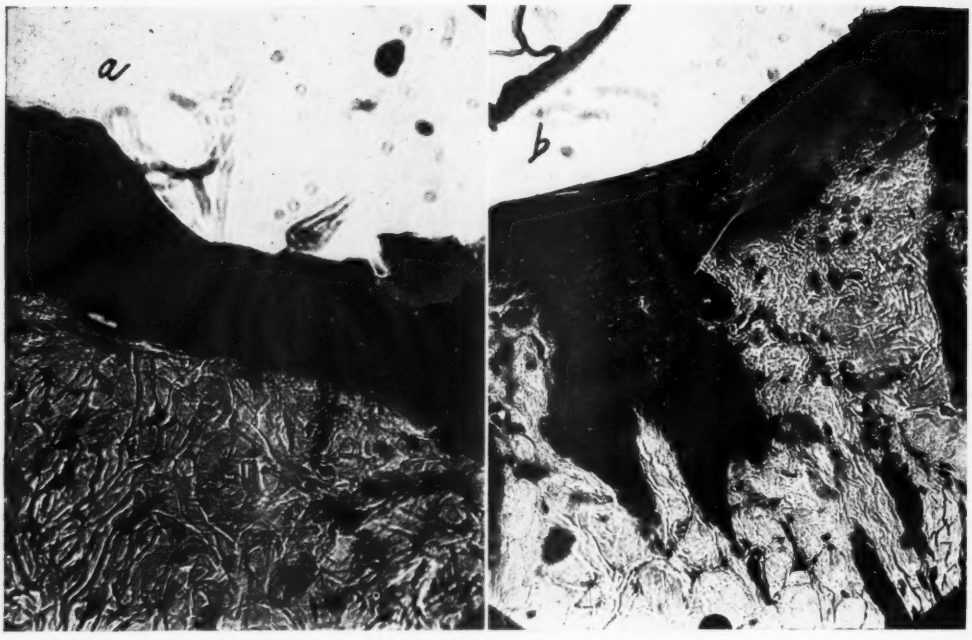


Figs. 13-*A* and 13-*B*. Twenty-four hundred r. Fourteen days. 13-*A*, upper field; 13-*B*, lower field.

as in the previous group at the same intervals.

DISCUSSION

When comparing the macroscopic and microscopic reactions in the different groups of animals, we were impressed by the small amount of individual variation. This facilitates, of course, the interpretation of the results. It seems evident that the two types of roentgen rays in doses as employed in our experiments produce very similar changes in the skin of rats. For both qualities of X-rays, the amount required for a well-defined macroscopic reaction is approximately 1,000 r; perhaps a little lower for the longer wave length. An increase of the dose soon leads to more severe reactions. Between 1,200 r and 1,300 r, erosions and slight ulcerations in parts of the exposed areas could be noted. For doses of 2,000 r and 2,400 r, the appearance of the X-ray ulcer, the time of healing, and the final scar are nearly identical for both qualities. The observation of Hausser and Schlechter (3) that the skin erythema in man does not increase proportionally to the dose if ultraviolet rays or borderline rays are used, could not be demonstrated in our animals. This may perhaps be explained by the difference which undoubtedly exists between the skin of human beings and the skin of rats. Sometimes, the reaction following the exposure appeared first in the upper field (long wave length) and also ran a more rapid course. This was particularly apparent with medium doses. In these groups, however, both fields were epilated and healed with almost identical scars. A daily study of the lesions is necessary for proper interpretation. The comparison of the reactions on one day only might lead to the impression that there was a more severe reaction either in the lower field (See Fig. 7-*B*, 2,000 r, 14 days) or in



Figs. 14-*A* and 14-*B*. Twenty-four hundred r. Thirty days. 14-*A*, upper field; 14-*B*, lower field.

the upper field (See Fig. 12-*A*, 2,400 r, 14 days). On the other hand, the reactions might be almost alike on one day (See Fig. 6-*A*, 1,500 r, 14 days), followed by a preponderance of the lower area (Fig. 6-*B*, 1,500 r, 30 days), while the inverse holds true in other cases. Some of the animals exposed to 2,400 r were kept alive for one year following the exposure. In not a single one of the seven rats studied during that period could we detect signs of a late reaction. The fields were still well visible, since the epithelium appeared thin and of a silver-white color. In several spots fine hair was growing. This growth was perhaps a little more marked in the upper field. While Herxheimer and Uhlmann (4) conclude from their experiments on human skin that for small doses the effect of roentgen rays of long wave length is partly similar to roentgen rays and partly to ultra-violet rays, we are more inclined to regard the borderline rays as true roentgen rays. This suggests, of course, that all the precautions adopted in roentgen therapy should be extended to Grenz rays.

SUMMARY

1. The skin of eighty rats was exposed to two types of unfiltered roentgen rays produced at 7 K.V. and 60 K.V., respectively. The dose amounted to 500 r, 750 r, 1,000 r, 1,250 r, 1,500 r, 2,000 r, and 2,400 r.

2. The reactions were studied macroscopically and microscopically. It appeared that the changes observed in the skin following exposure to both qualities of roentgen rays in equal doses were very similar.

3. Although it is not advisable to transfer directly the results of animal experiments to human pathology, the conclusion seems justified that roentgen rays of from 1 to 2 Ångströms should be used thera-

peutically as other roentgen rays. Clinical observations support this conclusion.

BIBLIOGRAPHY

(1) Pohle, E. A., and Bunting, C. H.: Radiology, December, 1929, XIII, 496.

(2) Monacelli, M.: Strahlentherapie, 1930, XXXV, 581.

(3) Hausser, Karl W., and Schlechter, Emil: Strahlentherapie, 1927, XXVII, 348.

(4) Herxheimer, K., and Uhlmann, E.: Arch. f. Dermat. u. Syph., 1929, CLVII, 467.

SINUSES (THERAPY)

Chronic Maxillary Sinusitis. J. P. Morton. Canadian Med. Assn. Jour., June, 1930, XXII, 808.

The paper is a report of successful results obtained from operative treatment in 73 cases of chronic maxillary sinusitis.

The many methods of examination now available render the diagnosis of chronic maxillary sinusitis a comparatively easy matter. A detailed history is important. Lavage decides the diagnosis if pus is found, but frequently there is no pus, for example, in polypoid conditions. Suction fails to operate in many conditions and is not trustworthy. Transillumination is not conclusive, since, by it, one cannot always judge between thickened mucous membrane and pus content. Roentgen rays give the most helpful information, especially after using lipiodol. The electro-nasal pharyngoscope may often be inserted if there is a good opening under the inferior turbinate; or the right-angled antroscope may be used. Palpation of the mucous membrane with a large blunt-pointed probe often gives valuable information regarding the condition of the mucous membrane and bone. If chronicity is determined, the only legitimate procedure is a radical operation, although occasionally cases of years' standing clear up after a few washings. The results of operation are so satisfactory that the author prefers to err by operating too early. The determination of chronicity is established when it is demonstrated that permanent mucous membrane changes have occurred. These changes consist of the finding of edematous, infiltrated, polypoid, hemorrhagic, or atrophic areas within the antrum.

The type of surgery to be employed is determined by the results of inspection of the mucous membrane of the antrum at the time of operation. If the whole mucous membrane is purulent, with polypoid, hemorrhagic, or atrophic areas, the radical Denker's operation of complete removal of the antral mucous membrane is done. All the bone between the opening of the canine fossa and the apertura pyriformis is also removed. If there are considerable areas of normal or nearly normal mucous membrane, the less radical Caldwell-Luc operation, with nasal flap, is done.

L. J. Carter, M.D.

POLYPI OF THE ACCESSORY NASAL SINUSES[1]

By FRED JENNER HODGES, M.D., Madison, Wisconsin

RECENT publications by Fraser (1, 2) and Hirsch (3) deal so exhaustively with the subjects of etiology, pathology, diagnosis, and treatment of nasal and intrasinus polyposis, and their attached bibliographies are so very complete, that to review in detail their work would be idle. It is the simple purpose of this communication to present some observations concerning the recognition of intrasinus polypi in the routine examination of the sinuses by the X-ray method.

Fig. 1. Right lateral view showing large lobulated or two distinct masses within the right antrum.

Fig. 2. Same case, showing visibility in Granger view.

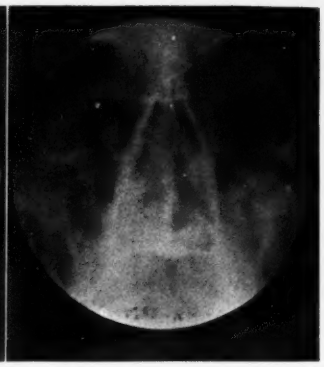


Fig. 3. Same case, again showing polyp on the right.

Since the establishment of the X-ray department at the psychopathic hospital for ex-service men, the Wisconsin Memorial Hospital, at Mendota, all patients admitted have been subjected to stereoscopic chest examination as well as examination of the head in dorso-ventral and lateral views. The lateral view is made stereoscopically; two flat films in Granger and Waters positions are made from behind. These examinations have been of value in uncovering silent lung lesions, foreign bodies, dental pathology, and sinus conditions, the presence of which might have been extremely difficult to determine otherwise in patients suffering from various mental diseases. In the films of six hundred such patients the occurrence of intrasinus polyp was not once noted, although various degrees of sinus clouding were rather frequently encountered.

At St. Mary's Hospital, Madison, Wisconsin, nearly three hundred sets of sinus films, made according to the same routine except that a Potter-Bucky diaphragm was used, were examined before a single case presented itself in which the diagnosis of an intrasinus soft tissue tumor mass was made. Nine months later a second case was encountered and the day following a third was seen. The first had by this time undergone operation and through an external window a cyst arising in the mucosa had been removed. Later this same operation was performed upon another case, with similar findings.

A systematic review of 1,000 sets of sinus films at the two institutions resulted

[1]Read before the Radiological Society of North America at the Fifteenth Annual Meeting, at Toronto, Ont., Canada, December 2–6, 1929.

Fig. 4. Medium sized polyp, left antrum; Waters position.

Fig. 5. Clean-cut polyp in left antrum; shows well in Waters position, poorly in Granger. This patient was operated on. After removal of cyst, symptoms of pain over the antrum and frequent colds were relieved.

Fig. 6. Large polyp, right antrum; partial clouding, left antrum.

in the discovery of twenty-four cases of clearly defined spherical soft tissue mass, usually single but occasionally multiple, within the confines of one or both antra. One additional case was later seen with two clearly defined masses within the frontal sinuses, making a total of twenty-five[2] instances (2.5 per cent) of intrasinus polyp. No cases of sphenoid polyp were discovered. In none of these cases have choanal polypi been found by the rhinologist and apparently these have been instances in which the polypi have not yet been expelled into the nose.

THE ROENTGEN APPEARANCE OF INTRASINUS POLYP

A polyp is recognized in the sinus film by its smooth, circular border of relatively short radius. The radius is always shorter than the average radius of the sinus cavity, for, until the polyp completely fills the cavity, some portion of its surface can be seen in silhouette and the curvature of this border will be rather sharply convex. Overexposure of the film reduces the visibility of the mass in direct proportion and in this series was directly responsible in many cases for the original oversight. Concomitant generalized opacity of the sinus cavity is not generally encountered in these cases. Occasionally the shadows cast by the ala of the nose and by irregularities in the upper border of the temporal bone may be confusing, but these can usually be readily ruled out by their lack of smoothness and true circular contour.

THE USE OF LIPIODOL

Undoubtedly opaque injection or suffusion of the sinuses in the hands of competent workers is of tremendous value in studying the sinus cavities. We have not used lipiodol extensively in this field, and, in the first case of this series, when used, the true state of affairs was effectively masked because of the great density of the oil and the relatively small size of the polyp compared to the total capacity of the cavity. The use of diluted oil would probably have resulted

[2]Figures 1 to 9, inclusive, are reproductions of films from seven of the twenty-five cases observed.

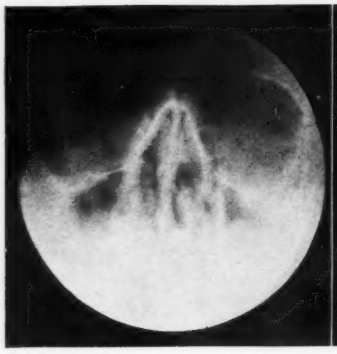


Fig. 7. Medium sized polyp, right antrum; probable multiple polypi, left antrum.

Fig. 8. Medium sized polyp, right antrum. This patient was operated on with considerable relief of symptoms.

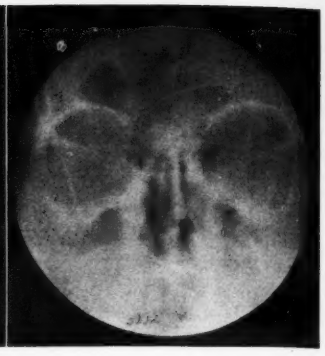


Fig. 9. Two small polypi within the frontal sinuses. These can be clearly seen in the lateral view and show well in stereo.

in perfect visualization. However, the point of interest to the referring physician is that, if properly exposed routine sinus films are carefully studied, polyps entirely invisible to nasal inspection and therefore usually unsuspected, can be demonstrated by the roentgenologist. When found, the accepted method of treatment is window resection and removal, so that further study with opaque injection, while interesting, is non-essential and should be reserved for those cases in which polyp is suspected but invisible by ordinary roentgen technic. The tell-tale polyp shadow is easily overlooked unless the observer is constantly alert, and it is to be remembered that at least three views must be studied, even though the Waters film, which is in such common use, offers the most information as a rule.

If films are made of dried skulls into the sinuses of which small rubber sacks filled with dilute iodized oil have been inserted, it will be found that if the artificial polyp is of relatively small size, it can be clearly seen in the Waters position, no matter where it is located in the sinus. If the polyp is very large, however, it cannot be seen well in this view but may be seen better in the Granger film. The shadow of the malar bone replaces the clear upper zone of the antrum characteristic of the Waters position and makes the recognition of faint polyp shadows difficult. These tumor masses are seen to advantage in the lateral view only when the X-ray beam is tangent to the hard palate—an infrequent coincidence in most routine lateral views.

SUMMARY

1. The discovery of twenty-five cases of intrasinus polyposis among the routine films of a thousand cases is described.

2. Accessory nasal sinus polypi can frequently be identified with certainty in routine X-ray examination of the sinuses without the aid of opaque oil.

3. Polypi are most frequently seen in the antra.

REFERENCES

(1) Fraser, Robert H.: Non-suppurative (Nasal) Sinusitis and the Principles of Hirsch (Vienna). Bull. Battle Creek San. and Hosp Clin., March, 1929, XXIV, 36.

(2) Idem: Diagnostic Uses of Lipiodol in the Paranasal Sinuses. Bull. Battle Creek San. and Hosp. Clin., March, 1929, XXIV, 50.

(3) Hirsch, O.: Nasal Polypi: Their Origin and its Solution: Review of Past and Present Knowledge. Bull. Battle Creek San. and Hosp. Clin., March, 1929, XXIV, 7-35.

DISCUSSION

Dr. Amédée Granger (New Orleans): I wish only to add my testimony to that of

Dr. Hodges, when he says that he has not found the lipiodol injection to be necessary for the study of pathology of the paranasal sinuses. My experience during the last seven years bears that out fully. When the sphenoid particularly is to be injected with lipiodol—and I assume that the injection would probably be made with a Sluder needle—I think it is very important to measure on a seven-foot lateral film the distance from the anterior nasal spine to the anterior wall of that sinus, and from the anterior wall of the sphenoid to its posterior wall (anterior portion of the sella floor), because, as was called to my attention by one of our prominent otolaryngologists, the former distance, usually accepted as averaging 8 cm., we have not found correct. In our work at the Charity Hospital, we found the average distance to be 6.5 centimeters. We recall two instances in which the injection was made without taking the precaution of measuring the distance from the nasal spine to the anterior wall of the sphenoid. When the operator perforated the floor of the sella he thought he was puncturing the anterior wall of the sphenoid, with the result that the lipiodol was injected through into the cranial cavity. Fortunately there was no serious result. The patient had a very severe headache for a period of about twenty-four to thirty-six hours, followed, a day or so later, by severe pain in the back and finally a lower lumbar pain which lasted for several days. In another instance, a probe supposedly held against the anterior wall of the sphenoid sinus by an assistant fortunately was seen by the chief of the service, who checked up on the graduated probe and noticed that the distance exceeded 6.5 cm. and became suspicious at once that the probe might not be against the anterior wall of the sinus but against the floor of the sella. A lateral view of the head was made and the probe was found to be actually against the floor of the sella. If the use of the probe had been followed by that of a hand drill or some other surgical instrument, the floor of the sella would have been perforated.

This measurement is readily made. You recognize at once on the plate the tip of the anterior nasal spine to which the septum of the nose is attached. It is readily seen, as are also the curved lines, with convexity toward the front of the head, which are produced by the greater wings of the sphenoid and which lie parallel to the anterior surface of its body, so that they become a landmark for its anterior wall. Even on a six or seven foot film there is a slight magnification, so that the measure you give to the laryngologist is three or four millimeters greater than the actual distance. Fortunately, that slight increase is corrected by the thickness of the soft tissues, as he has to take his measurement from the junction of the septum with the upper lip, and in practice, therefore, his measurements check up absolutely with ours.

INTRAVENOUS PYELOGRAPHY[1]

By A. von LICHTENBERG, M.D., Berlin, Germany

THE demonstration of contrast material in the urinary organs is made possible by two methods: First, through the filling up of these organs by the introduction of instruments into the interior of the body—instrumental pyelography or urography; second, by utilizing renal function as the dispenser of contrast media—excretion pyelography or urography. This can be effected through the introduction of contrast media by mouth, rectum, or vascular system, especially by vein. This latter method, intravenous pyelography, and the disclosures made by it, form the subject of this report.

Intravenous pyelography is entering upon a momentous period of development. Although the idea is not new, experimental knowledge is universally limited, for it is but recently that reliable means have become available; therefore, it is not possible at the present time to form any conclusive opinion, and a report can afford only a glimpse into a newly discovered land. On the basis of over six hundred clinical investigations, and intensive labor in the field of urography, I shall endeavor to convey this glimpse to you. I should like particularly, wherever possible, to state the indications and limitations of intravenous pyelography, and I thank the German Röntgen Society for entrusting to me the presentation of this report.

A few brief remarks relative to the history of intravenous pyelography may be permitted. The first experiments were undertaken by Völcker and myself in 1905, immediately following the announcement of instrumental pyelography. These experiments were not successful, due to the toxicity of the colloidal heavy metals used at that time.

In 1923, Rowntree and his collaborators made public the first promising experiments with excretion pyelography. For this purpose sodium iodid was used. The result of their experiments must be accepted as the first proof that this method, in its essential points, was feasible.

In connection with this publication, I, too, together with Rosenstein, took up the work, using sodium iodid with the aid of pneumoradiography, but found it of no clinical value. The experiments of Volkmann, in this direction, were also without result.

Lenarduzzi and Pecco were the first to ligate the ureter, in animal experimentation, utilizing the blockage for the purpose of increasing the concentration of the contrast substance. This method also had at first only theoretical value. It was Roseno who, through the intravenous administration of an iodin-urea compound, achieved clinical results, and fostered the theory essentially. His method was then supplemented by the researches of Ziegler and Köhler, who added materially to the previously tested compression of the ureter. That Roseno's suggestion did not meet with the expected response was due to the facts that his product was not tolerated without alarming secondary manifestations in many cases, that excretion was considerably prolonged, and that visualization was sufficiently satisfactory only in special cases.

Intravenous pyelography, to be of general clinical value, can be perfected only if one has a non-toxic product that can be excreted by the kidneys in sufficient concentration to assure visualization of the urinary tract with certainty.

Credit is due to Hryntschak, of Vienna, and Lichtwitz, of Altona, that they, independently of each other, made experiments with the selectan preparations of Binz and

[1]Read before the Congress of the Deutschen Röntgengesellschaft (German Röntgen Society), April 27, 1930.

Raeth, and proved that these preparations were especially adapted for use in excretion urography. Lichtwitz's collaborator Swick, under my direction, continued the work upon these grounds. The selectan-neutral hitherto used by Lichtwitz and Swick did not permit the administration of sufficient iodin for good visualization. Excretion was slow, and the results so uncertain that, out of eight suitable cases, a film of the renal pelvis could be obtained in only one instance of calculus obstruction.

Several conferences with Binz led to the selection by him of 5-iodin-pyridin-N-acetic acid sodium, a compound later called "uroselectan" by me. This preparation meets with all the requirements that can be expected of any one medium for use in excretion pyelography. It is quickly excreted, highly concentrated, gives good shadows, and produces no injurious after-effects when the proper amount for intravenous pyelography is administered.

At the Urological Congress, held in Munich the latter part of September, 1929, we presented our report on uroselectan and its clinical application. Since then, further observations have been reported by others which have substantiated our findings.

The technical details relative to the application of uroselectan have been referred to in our publications. I do not here wish to discuss these details in their entirety, but desire merely to state that we inject intravenously, as heretofore, 100 c.c. of a 40 per cent uroselectan solution, and take the first film a quarter of an hour, the second three-quarters of an hour, and the third one and one-quarter hour after the injection.

The use of uroselectan in intravenous pyelography is of threefold value.

(*a*) It affords visualization of the urinary tract, with especial reference to its system pathology and physiology.

(*b*) It affords, through pictorial nuances and qualitative and quantitative chemical analyses, knowledge of the renal function.

(*c*) It affords an insight into the dynamics of the urinary tract by permitting the examiner to observe the expulsion of the medium through the tract.

In connection with (*a*), it is important to know what type of film one may expect from this method.

1. Of course, a diagnostic film can be expected only in cases in which renal function is present, and the density of this film is dependent, in the greatest measure, on the amount of function that exists. Severe bilateral infections of the kidneys, particularly those conditions associated with a damaged purulent parenchyma, give no shadows, or only faint or considerably delayed shadows.

2. The clarity of the film is entirely dependent upon the uroselectan-threshold of the kidney, *i.c.*, upon the concentrated uroselectan-urea solution eliminated by the normal kidney. We have been able to establish in a large number of cases with normal renal function that this concentration amounts to about 5 per cent. But this 5 per cent uroselectan solution by no means produces contrasts as strong as those produced by the 20 per cent solution of sodium bromide, or umbrenal, formerly used in instrumental pyelography; that is, we must not expect very dense shadows even in the best cases. Where damage exists, the intensity of the shadow is diminished. In blocked conditions one frequently obtains more clearly defined shadows than could be expected from the concentration of uroselectan eliminated by the kidney.

3. We must take into consideration to what extent the excretory passages are filled up with the contrast substance, and the state of these passages after they have emptied naturally. In other words, only those parts can be filled which are in the relaxed state of diastole when the injected

substance reaches them, while the contracted parts of the calices, renal viscera, and ureter—those parts which are in a state of systole—can not be seen in the X-ray film. One must always remember that he is dealing with a dynamic condition of the urinary tract, which, as in the case of peristalsis, is continually undergoing change in form. Therefore, there are many instances which, due to the examiner's unfamiliarity with the method, might be construed as defects in the method. On the contrary, they give valuable insight into the normal and pathologic physiology of the excretory urinary passages, and only *appear* to be defects.

As a result of our experiences, we can say that simple disturbances of the renal function are not perceptible by this method. Testing of function by pictorial means is, therefore, not an exact method, but it suffices for the gross clinical diagnosis of surgical lesions. Localization of the infection is possible in one-sided conditions, and often in bilateral conditions it is possible to establish which side is most affected. These films are sometimes sufficient basis for making a clinical diagnosis.

Hypertonia and hypotonia of the excretory urinary passages can be visualized in normal as well as pathologic conditions. The renal picture is much clearer than usual, and in many cases of tubular damage it is particularly clear because of a sort of storing-up in the parenchyma. Nevertheless, a good nephrography is not yet possible by means hitherto employed.

Relative to (*b*), excretion of the uroselectan by the kidney can be followed, aside from the roentgen-ray control, through the control of the excretion of the substance itself, through the control of the iodin excretion, through the control of the increased specific gravity, which can all be regarded as excretion tests in the general sense of the word, and through the fixation of the uroselectan in the blood, which can be viewed as a retention test. All these together present a type of function test of the entire renal function. I will go into these tests only briefly here.

Uroselectan contains 42 per cent of organically bound iodin. Of this injected iodin substance—about seventeen grams for each test—90 per cent is excreted by the kidneys according to the facts established by Swick and the findings of Heckenbach, and the greatest amount of this is excreted within the first two hours after injection. Where renal function is more or less good, fifteen to sixteen grams of iodin are excreted after ten hours. If excretion is delayed over a longer period, then, from a surgical point of view, the general function may be looked upon as being definitely bad. The urinary excretion is considerably increased during the first two hours, but, after the second hour, as the iodin is expelled, diminishes in amount. There appears to be a clean washing out of the uroselectan, and through this, good excretion of the iodin is accomplished, both in excretory disturbances and obstruction of kidneys which are functioning under an increase of urine production and decreased concentration, a condition which may be mistaken for intact functional activity. Dynamic disturbances, which delay or hasten excretion, may also serve as sources of error. Frequently, in bilateral infections and functional disturbances, one can determine only from 50 to 70 per cent of the injected iodin substance in the urine. Without doubt, excretion is here accomplished compensatorily through the liver and intestine.

Through acidification of the urine the uroselectan is separated from the substance. However, the exact quantity in the urine cannot be determined. In the best cases, 70 per cent of the injected material can be verified in the urine. According to the methodical researches of my assistant Heckenbach, this result is too inaccurate to warrant en-

larging upon it for clinical tests. On the other hand, the increase and decrease of the sepcific gravity show good regularity, which furnishes us with particulars similar to those revealed by concentration or attenuation tests. At first the specific gravity rises to 1050-60, and then falls to 1030. It is remarkable, however, that the specific gravity continues to rise even after the greatest concentration in the excretion of iodin has been achieved. Also, after these tests it appears that the choice of the moment—the roentgen-ray control after the injection of uroselectan—is rightfully made, as the best pictorial presentation must naturally in time correspond with the most concentrated excretion.

The H-ionic concentration of the urine is shifted to the side of acidification, and that to 5, 8-5, 2 from the third to fourth hour after the injection, but after the sixth hour returns to 6, 8, without the previously rendered acid or alkaline quality of the urine having played a rôle. This alteration does not occur in poor renal function, as my collaborator, Hughes, has established.

Contrary to our first report, one can find the uroselectan in the blood again. According to the researches of my assistants Tourné and Damm, the uroselectan blood curve rises abruptly during the first two hours and sinks more gradually during the later hours, and—what is of particular importance—no uroselectan is found in the blood after four hours where normal renal function exists. Quantities less than one-half of a gram produce an insignificant reduction of the renal function after four hours; quantities over that amount produce a higher grade of function. The conformity between these results and the other clinical function tests justifies the consideration of the four-hour uroselectan residue in the blood as a retention test.

To support the tests of Schlayer and his collaborators, Tourné and Damm have also made tests to ascertain where the uroselectan can be found in the body. One may say that, in general, the uroselectan is distributed in the body in an excretion depot and a storage depot. The kidney particularly serves as the excretion depot; next in order, the liver. The skin may be regarded as the storage depot. This fact is of value in conditions in which the method is contra-indicated, and the conclusion to be drawn is, that in cases of severe damage to both excretion depots, disturbances may result therefrom. In the light of this, one can explain the fatal case reported by Kalk. In animal experimentation, small animals, like rabbits, die shortly after the ligation of both renal arteries, and that after the administration of an otherwise non-toxic dose of uroselectan, from appearances that point to destruction of the capillaries. There is much injection of the serous membranes with transudate formation in which uroselectan can be found.

Finally, it was of interest to follow the finer mechanism of the uroselectan excretion in the kidney itself. My assistants Hughes and Schaffhauser, under the direction of Prof. Péterfi, punctured the glomeruli of a frog's kidney, and after the injection of uroselectan were able to ascertain the amount of it excreted by quantitative micro methods. Two-tenths of a gram of uroselectan was injected into a frog weighing forty grams; that is, about nine times as much as one would inject into a man weighing seventy kilograms. In the glomerular fluid collected for one-half hour, there was found three gamma (μ) (0.000003 gm.) of iodin. This corresponds to about seven gamma (μ) (0.000007 gm.) of uroselectan. Since there are 4,000 glomeruli in the two kidneys of a frog, the entire amount of uroselectan excreted would be about twenty-eight milligrams, an amount which corresponds to the excretion of the human kidney. Calculations made in connection with

the results obtained by similar puncture of the tubule are not yet conclusive, but one cannot hope for positive results from this test because of many physiological difficulties as well as difficulties in connection with the method employed. One can say, however, that the greatest portion of the uroselectan secretion passes through the glomeruli, which explains excretion disturbances in conditions where the glomeruli are particularly affected.

Neither the coagulation time of the blood nor the rapidity of sedimentation is altered by the injection of uroselectan, therefore it does not appear that any special danger of thrombosis or embolism may arise following its injection. Out of the fifteen hundred cases that came under our observation, only eight developed small thrombi at the point of injection, instances which can, without doubt, be attributed to local injury to the intima.

This slight theoretical deviation was necessary in order to familiarize my readers with the effect of the injection of uroselectan upon the organism. It is of clinical value because the fixing of the four-hour residue in the blood can be utilized as a rough retention test. In a great many respects it is similar to the indican test. From observations made in the study of excretion further function tests may develop. In cases of obstruction, the possibility of storage should, by all means, be taken into consideration.

Damaged glomeruli give bad, or no shadows at all, especially in cases with purulent infection of the parenchyma, many forms of tuberculosis, and tumors. On the other hand, clean obstruction, in tubular destruction, even in a far advanced stage, will give good shadows.

In connection with (*c*), in normal conditions, as in pyeloscopy, one may observe the secretion of uroselectan in serial films. Fluoroscopy, in which Dr. Rave, Director of the Roentgen Department of St. Hedwig's Hospital (to whom I am also indebted for complete film records), is particularly interested, is possible only in cases of severe obstruction, therefore not generally applicable, as the contrast action of a 5 per cent uroselectan-urea solution is not sufficient in fluoroscopy. According to the observations of Schaffhauser, shadows are first produced after the use of a 15 to 20 per cent solution of uroselectan, which is as intensive as sodium bromide or umbrenal. As do Prätorius, Boeminghaus and Weber, we also use uroselectan in this concentration for instrumental pyelography, and can also heartily recommend its use in this form, because the substance is non-stimulating and easily tolerated.

It is as a rule possible distinctly to see the action of the ureters in intravenous pyelography. It is not only peristalsis and its disturbances that can be perceived, but the swinging movements and changes in position of the ureters, angles and loops, contractions and isolated dilatations can be recognized with certainty.

To materially perfect the roentgen-ray examination of the urinary organs would mean that intravenous pyelography could also be of use in those cases in which cystoscopy fails or presents difficulties, or in cases in which catheterization of the ureter, or instrumental pyelography is not applicable or would yield no results, as well as in cases in which these examinations could not be carried out because of possible injury. Orientation of the urinary tract is made possible by intravenous pyelography in patients suffering from stricture, severe bladder affections, hemorrhage, fistula, and in small children. Also in cases in which one hesitates to use the catheter, that is, in acute and chronic inflammatory infections of the

adnexa, in tuberculosis, and in cases of prostatic hypertrophy, the employment of intravenous pyelography is a safe method.

In the following instances intravenous pyelography is indicated from the standpoint of a clinician:

(1) In those cases in which cystoscopy, catheterization of the ureter, and instrumental pyelography cannot be performed because of anatomical, pathological, or technical reasons.

(2) In all cases of ureteral obstruction in which the contrast substance by means of instrumental pyelography does not pass the point of obstruction.

(3) In those cases in which instrumental pyelography cannot be undertaken without risk to the patient. To this group belong those patients whom one wishes to spare the pain of catheterization, and of whose condition one can obtain sufficient information through intravenous pyelography.

PEAK VOLTAGE MEASUREMENT IN DIATHERMY

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IN the heating of tissues by high frequency diathermy currents, a milliammeter in series with the subject receiving the treatment records the current passing between the electrodes. The current is adjusted by the spark gap or by the impedance in the primary circuit of the 60-cycle transformer to a value sufficient for the dosage. In practice, it is assumed that the current as indicated by the milliammeter per unit area of electrode will give an indication of the temperature increase of the tissues below the electrode.

Recently Kelley (1) has asserted that it is voltage rather than current which determines the heat production below the diathermy electrode. Sampson (2) states that "the high voltage current has a much greater heating value, milliampere for milliampere, than the low one." It is with the intention of investigating quantitatively the effects of voltage variation on heat production in diathermy that the following experiments were undertaken.

In diathermy it is necessary to distinguish between two types of voltage, namely, "peak voltage" and "root mean square voltage." The following diagram (Fig. 1), which is purely schematic and not drawn from an experimental record, will illustrate peak voltage.

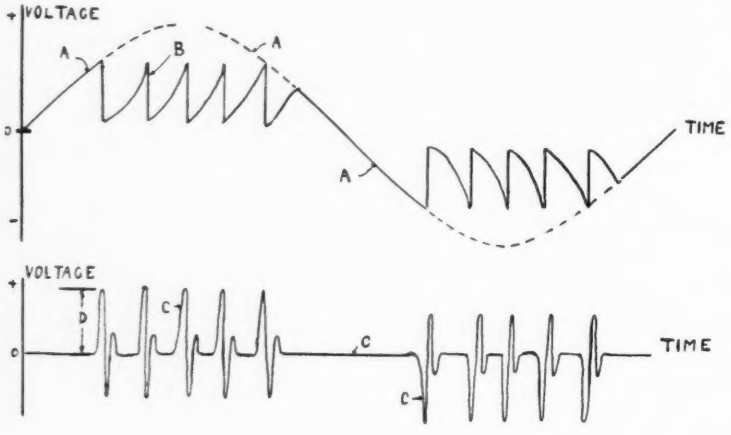

Fig. 1.

The low frequency (60 cycles per second) voltage is "stepped up" by the low frequency transformer to a high voltage of low frequency which is impressed on the condensers. This is represented in Figure 1 by the Curve *A*. When the voltage on the condensers reaches a value sufficient to produce sparking at the spark gaps, a spark discharge at the gaps occurs and the condenser low frequency voltage drops (see *B* in Fig. 1). At the same time an oscillating current of high frequency similar to *C* is produced in the oscillating circuit contain-

ing the air core autotransformer, high voltage condensers, and spark gaps. This high frequency current, whose frequency is determined by the capacity and inductance of the oscillating circuit, passes through the patient. The resultant voltage on the condenser at any instant then will be given as the sum of voltages similar to *B* and *C*. The peak value corresponding to *D* of the oscillating voltage applied to the patient will be referred to as the "peak voltage."

The current passing through the patient also has a wave form similar to the voltage of Figure 1. The current registered by the meter, however, records the "root mean square" current, being the square root of the average of the squared values of the instantaneous current. Corresponding to the "root mean square" current there is a "root mean square" voltage, which also gives an average effect of both positive and negative halves of the voltage cycle.

In Figure 2 is given a circuit to measure this peak voltage. The circuit to the left of the calorimeter represents the usual diathermy circuit with low frequency transformer, high voltage condensers, spark gaps, and air core autotransformer. In parallel with the calorimeter containing a solution of approximately 60 ohms high frequency resistance, which has been shown in an earlier paper (3) to be an average resistance of a patient in diathermy, is a voltage divider. The latter consists of two high resistances, one 142 times as large as the other. Leads from the terminals of the lower resistance go to the filament of a UV 201 A tube and to one end of a high frequency potentiometer. This consists of 10 1,000-ohm resistance units in series with 10 100 ~ units, each unit being an El Menco high frequency resistor. High frequency choke coils are placed in the 110 volt D.C. circuit. The galvanometer in the plate circuit of the tube is a sensitive wall galvanometer with a mirror, lamp, and scale.

The voltmeter operated in the following

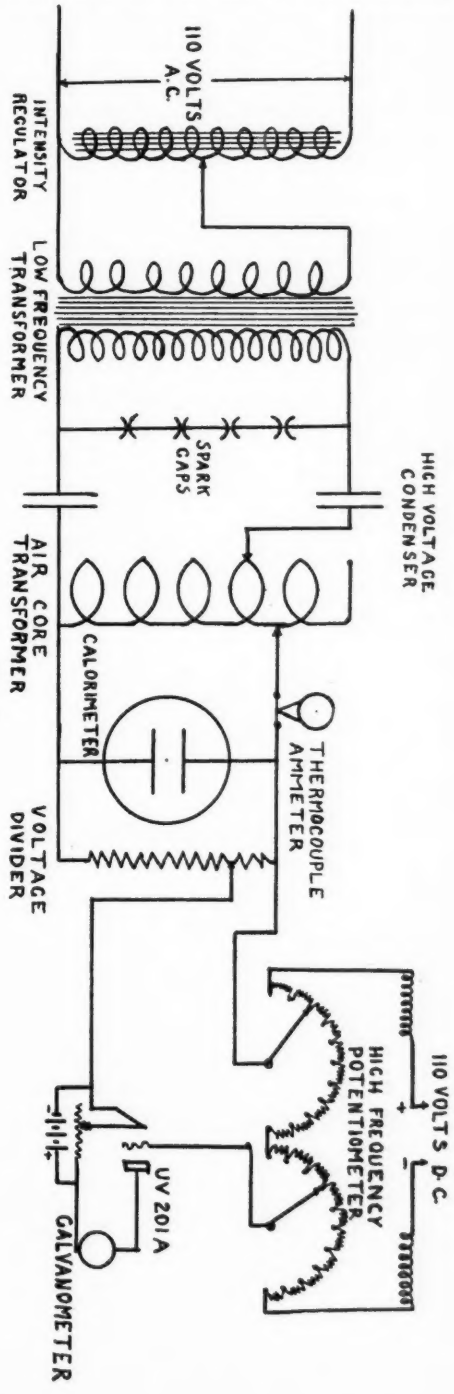

Fig. 2.

manner. Due to the heated filament, electrons were emitted and on reaching the plate gave an indication of a small plate current in the galvanometer. On adjusting the potentiometer to make the grid —4 volts with respect to the filament, all the electrons were driven back to the filament and none reached the plate; consequently the galvanometer registered zero current. The alternating diathermy voltage similar to that in Figure 1 was now applied between filament and grid through the potentiometer. During the negative half of the cycle all electrons were driven back to the filament. During the positive half of the cycle the positive grid drew electrons to the plate and a plate current was recorded. A negative voltage from the potentiometer now opposed the positive voltage in the positive half of the cycle and this negative voltage was increased until the plate current was again zero. At the point where the plate current became zero the potentiometer negative voltage (except for the four volts to remove the residual current) was just equal to the peak voltage. If the negative grid voltage was decreased, a greater plate current resulted. For a greater negative voltage beyond the peak voltage obviously no plate current would be recorded.

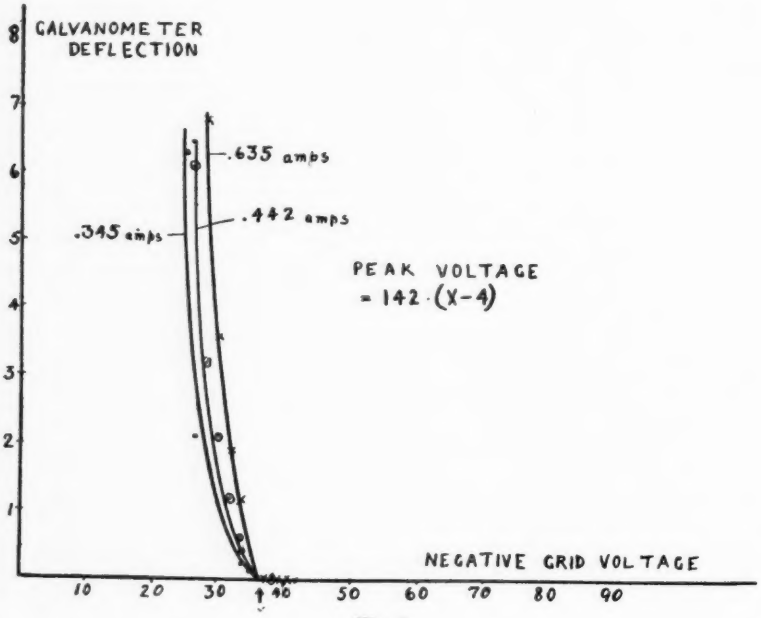

Fig. 3.

In Figure 3 is recorded the curves taken to measure the peak voltage when the spark gap was fixed and the diathermy current was adjusted by varying the impedance of the low frequency transformer primary circuit by the "intensity regulator." The plate current, as recorded by the galvanometer deflection, is plotted on the ordinate, while the negative grid voltage is plotted on the abscissa. In Figure 4, with the same method of representation, is plotted the values of the peak voltage when the intensity regulator is fixed and the diathermy current adjusted by varying the spark gaps.

The heat energy imparted to the solution was measured by passing a known current

through the solution for a given time and measuring the temperature increase. From the weight of the solution and the container it was then possible to compute the rate of heating the solution in watts. Corrections were made for small radiation losses. A more detailed account of the type of calorimeter used is given in an earlier paper (3). This calorimetric value of the rate at which the solution receives energy is given in the tables as $\frac{\triangle H}{\triangle t}$ where H refers to heat energy in calories and t to time.

The current was recorded by a vacuum thermocouple micro-ammeter system which was calibrated with D.C. Knowing the resistance values from measurements with the high frequency Wheatstone Bridge of Dr. J. F. McClendon[1] (4), the theoretical I^2R values of the heat produced in the solution were computed. In this expression I is the diathermy current and R is the high frequency resistance of the solution.

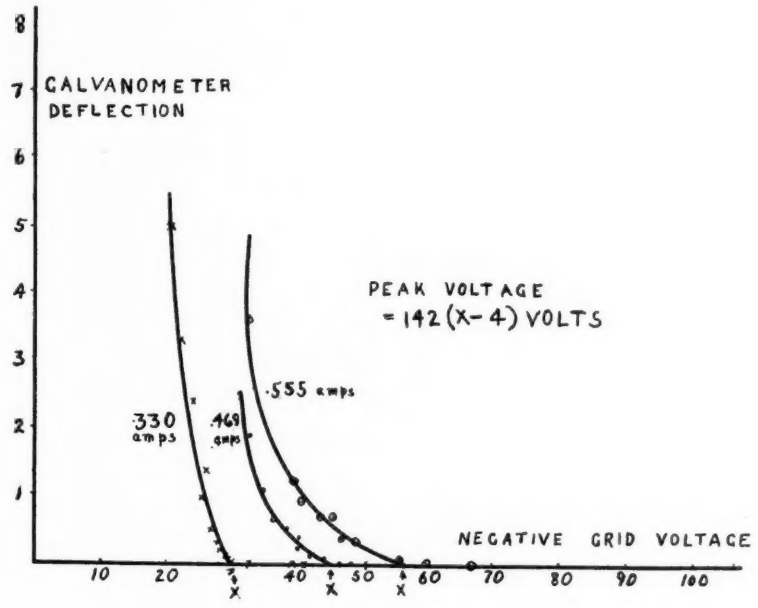

Fig. 4.

TABLE I

I current	$\frac{\triangle H}{\triangle t}$ watts	I^2R watts	Peak voltage volts
0.345	5.8	6.4	4900
0.442	10.1	10.3	4900
0.595	17.5	18.6	4900

TABLE II

0.330	5.5	6.1	3700
0.469	11.3	12.2	5700
0.555	18.7	17.0	7500

In Table I are given values of the heat produced in the solution per second when the spark gap was constant and the current was varied by the "intensity regulator."

[1]For details, see reference.

The peak voltage for these three measurements is recorded in Figure 3, where it is to be noted that the plate current of the vacuum tube becomes zero for the same negative opposing voltage of the potentiometer, and is independent of the diathermy current.

In Table II are given similar values of the energy production, but in this case the current was adjusted by varying the spark gaps while the "intensity regulator" remained fixed. The corresponding peak voltages are obtained from Figure 4.

In Table I it is to be observed that the peak voltage remained constant at 4,900 volts, the spark gap being fixed, but the heat production was determined by the current according to the I^2R value. In Table II the peak voltage was varied, causing a variation in current. In this case also the heat production varied with the current according to the I^2R relation. In the experiments with voltage recorded here it is to be noticed that it is the total heat production which is being measured and not the heat distribution.

In these six experiments the coupling of the air core transformer remained fixed.

RESULTS

The "peak voltage" is determined by the spark gap interval, the wider the gap the greater the peak voltage.

The heat energy of diathermy is given by the I^2R value and is determined by the current and not by the peak voltage. Variation of the spark gaps and hence the peak voltage affects the heat production only insofar as it varies the diathermy current.

In conclusion, I wish to thank Dr. W. K. Stenstrom and Dr. J. F. McClendon for their advice, assistance, and co-operation during the course of these experiments. I also wish to express my appreciation to Dr. H. E. Hartig, of the Department of Electrical Engineering, for his interest in this problem and for many useful suggestions.

BIBLIOGRAPHY

(1) KELLEY, ANN: Voltage Is a Factor of Prime Importance in Administration of Diathermy. Hosp. Management, 1929, XXVIII, 45.

(2) SAMPSON, C. M.: A Practice of Physiotherapy. C. V. Mosby Co., St. Louis, 1926, p. 74.

(3) HEMINGWAY, A.: Thermal Effects of Diathermy. RADIOLOGY, February, 1930, XIV, 99.

(4) MCCLENDON, J. F.: Polarization Capacity and Resistance of Salt Solutions, Agar, Erythrocytes, Resting and Stimulated Muscle, and Liver Measured with a New Wheatstone Bridge Designed for Electric Currents of High and Low Frequency. Protoplasma, September, 1929, VII, 561.

CHOLECYSTOGRAPHY

AN ANALYSIS OF 500 CASES OBSERVED BY MEANS OF THE ORAL METHOD

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CHOLECYSTOGRAPHY has achieved universal recognition as a reliable method in the diagnosis of gall-bladder disease. It has made possible the diagnosis of many obscure gall-bladder conditions which could not otherwise be recognized. The test furnishes not only a means of ascertaining the functional activity of the gall bladder, but presents a relatively accurate anatomical picture, which is essential in the diagnosis of disease of this organ. Attention should also be directed to the fact that it may even reveal a normally functioning gall bladder, provided the pathological process has been eradicated. This had occurred in several instances in our series: the gall bladder functioned and appeared normal several years following the removal of stones.

However, the diagnosis of gall-bladder disease by this method is not infallible and should be considered together with the clinical data, in the same way as any other laboratory test. There are differences of opinion as to its reliability, but as Kirklin (1) well states: "The variances are due primarily to the lack of knowledge as to where the line should be drawn between the normal and abnormal gall bladder, both anatomically and functionally." There are also differences of opinion as to the method of administration of the dye, some preferring the intravenous, while most roentgenologists advise the use of the oral method. Although recognizing that the intravenous method is slightly more accurate, its slight advantage in accuracy does not appear to compensate for its disadvantages. As a matter of fact, the results of cholecystography obtained by either the oral or intravenous method differ but to a slight degree. They depend as regards both methods in a large measure upon the roentgen technic and interpretation Graham and his co-workers (2), Case (3), and others recommend the intravenous method as being the most reliable, but on account of the ease with which the oral procedure is performed and owing to the lessened severity of the reactions produced by the dye, this latter method is preferable according to my experience.

The reliability of cholecystography is now unquestioned, regardless of the method employed. In some instances the slight difference obtained by the two methods may be due to faulty roentgen technic and interpretation. On the other hand, it is quite possible to obtain abnormal results even though the gall bladder may be perfectly normal. Plummer (4) observed that a certain type of patient characterized by certain stigmata, that is, easy fatigability, achlorhydria, low basal metabolic rate, is likely to respond eccentrically to cholecystography, the shadow being often faint or absent in these cases.

The results of cholecystography by the intravenous method have been reviewed by Graham (5), who compiled 561 cases, with operative findings. Of 446 cases, 97.8 per cent were proven correct; but in the entire group the total was reduced to 90 per cent. He further states that a correct diagnosis of the normal gall bladder may be arrived at in only 74 per cent of cases. Case (6) notes the operative findings in 277 cases by the intravenous method, with a total correct diagnosis in 90 per cent. He found the greatest

accuracy in the cases in which there was an absence of shadow (97.5 per cent); in the non-calculus cases (83.6 per cent) and in the normal there were but 83.4 per cent of positive results. Kirklin (1) in a series of 506 cases studied by the oral method obtained a total correct diagnosis in the entire series of 87.3 per cent. It is also interesting to note that the presence of stones was proven by him in 98.4 per cent, while in cholecystic disease 79 per cent showed marked evidence of disease without stones. In the group revealing slight pathologic changes the test was positive in only 66.6 per cent. Of 111 normal gall bladders which came to operation he noted an error in 24.4 per cent. Lockwood and Skinner (7), in an analysis of 1,500 cases examined by the oral procedure, found that of the pathologic cases 96.4 per cent were proven correct at operation. Hardman (8), Robins and Goldberg (9), and Lord (10), also employing the oral method, report their confirmed correct diagnoses ranging from 85.4 to 93 per cent.

TECHNIC

The technic must of necessity be a simple procedure in order to obtain the patient's complete co-operation. He is given a printed list of instructions, with the explanation that every detail must be carefully followed. In order to standardize the technic we advocated a method in 1926 (11) which we have since followed with satisfactory results. We have especially stressed several points which the patient must follow in order to obtain reliable roentgenograms of the gall bladder. The patient is impressed with the importance of taking all the capsules of tetraiodophenolphthalein, regardless of manifestations such as nausea or vomiting, and of abstaining from food or medicines.

The oral procedure is performed similarly to that followed with but few exceptions in other clinics. If the liquid or powdered dye is given in one dose, the same procedure is carried out as with the use of the capsules. Although the former is somewhat simpler, we have employed the capsule as a routine, which, according to my experience, gives more satisfactory and uniform results.

No previous preparation of the patient is necessary. Two plain films are usually made of the gall-bladder area before the dye is administered in order to observe the presence of possible positive stone shadows or a visible gall-bladder shadow, and also to study the films in comparison with the cholecystograms. The patient is then instructed to take half of the capsules at 5 P. M. with a meal consisting of two soft boiled eggs, one glass of milk, and one slice of bread and butter. Two hours later he begins to take capsules at the rate of four every fifteen minutes until all the capsules are administered. After the last capsule the patient is advised to lie on his right side for an hour. He is instructed to return for X-ray examination on the following morning at 9 A. M. on a fasting stomach.

According to my experience, when half of the capsules are taken with the evening meal, very little digestive disturbance is encountered. The fatty meal is also required inasmuch as it stimulates the contraction of the gall bladder and thereby discharges an excessive amount of alkaline bile into the duodenum, which aids in transforming the acid compound of the dye into its soluble salt. The acid compound is insoluble and is not absorbed, while the alkaline salt is readily absorbed in the intestinal tract.

In sixteen hours the patient returns for the roentgen examination; at this time a series of five films is made, three on deep inspiration and two on deep expiration. This procedure is highly important for many reasons; first, it demonstrates the mobility of the gall bladder and whether or not a shadow in the gall-bladder area shifts with the

gall-bladder shadow; secondly, changes in respiration will ofttimes reveal the gall-bladder shadow to be poorly outlined on inspiration, while on expiration the shadow may become very distinct, or *vice versa*. On the other hand, the gall bladder may be overshadowed by the vertebræ or by a dense psoas muscle, which, on shifting the position, changes, whereupon the shadow becomes more clearly visible. Then, again, the shadow of the liver and kidney may interfere with the visibility of the filled vesicle, and, finally, the gall bladder may be overshadowed by gas or dye in the colon, which at times becomes very confusing. To overcome these difficulties the shifting of the gall-bladder shadow is an extremely valuable aid in the diagnosis. A lateral or oblique view of the gall bladder is at times necessary to complete the study.

Normally the gall-bladder shadow is of even density, varying in different individuals. It is homogeneous and regular in outline. Variation in density of the shadow is an extremely important sign in the early recognition of gall-bladder disease. There is a wide latitude in what is termed normal density, however, and this results in an increasing difficulty in the diagnosis. This may be an essential factor in the many errors of interpretation. There is a type of shadow, faint in appearance, apparently shading off into the other organs, which must be considered, according to my experience, as of value in the diagnosis. This sign, although not infallible, may be of some importance. There has been a great deal of confusion regarding the terms "lessened density" and "faint shadows." A shadow of lessened density which is clearly outlined and homogeneous and contracting normally must be considered within normal limits, while a persistent faint shadow shading off into the other organs must be looked upon as abnormal. The diagnosis of gall-bladder disease from variations in density, according to Case (3), is of little importance when applied to the oral method, due to the impossibility of determining the amount of dye which has been absorbed. In my experience, the administration of the maximum dose of the dye by the oral procedure, together with a fatty meal, eliminates this factor of absorption in most instances, and hence the density of the shadow becomes more significant and can be taken into consideration in the diagnosis. The high percentage of correct diagnoses by the oral method proves the correctness and the efficiency of this procedure.

The contraction of the gall bladder in from one to two hours following a fatty meal is an important test of its function. If the gall bladder fails to fill, the examination is concluded. When the gall bladder is filled, the patient is given a fatty meal, two films being made an hour afterward.

Contraction of the gall bladder varies in different individuals. Normally the vesicle contracts from a narrow cord-like shadow to one-half of its original size, but at times the shadow may be absent following this meal. Occasionally the vesicle does not contract at all or contracts poorly or irregularly, due to the presence of stones or a diseased condition. As a result of a diseased and thickened gall bladder, the shadow may not vary in size or may diminish but little, indicating a sluggishness of its contractile power. Frequently under normal conditions the contracted vesicle shadow becomes denser than the original gall-bladder shadow.

Tetraiodophenolphthalein administered in five-grain enteric-coated capsules was utilized in this series. The doses varied in different individuals, depending upon the weight and stature of the patient. The dose is given uniformly by body weight, as a rule, as follows:

100 to 110 pounds.....12 capsules
110 to 125 pounds.....15 capsules

125 to 140 pounds.....16 capsules
140 to 180 pounds.....18 capsules
180 to 190 pounds.....20 capsules
190 to 210 pounds.....22 capsules
210 to 230 pounds.....25 capsules

From 12 to 26 capsules may be given. In order to obtain uniform results the maximum dose of the dye is recommended. The dye is harmless when given orally, and, since there is at times a question of how much of the dye is really absorbed in the intestinal tract, the larger dose fully allows for adequate absorption. In one instance 36 capsules were given to a patient without any ill effect.

A high gastric acidity may produce a chemical change of the dye in some instances, which undoubtedly interferes with the filling of the gall bladder. We have found, for instance, that in dogs a satisfactory gall-bladder shadow can be obtained when the gastric juice is reduced by tying off the duodenum, but no shadow can be obtained when the dye is given orally (12). In thirty instances in which the gastric analysis and operative findings were recorded by us (12), the acidity was found to have but little bearing on the filling or non-filling of the gall bladder, except that it may lessen the density of the shadow to some degree. Eusterman (13) maintains that the gastric acidity interferes with normal visualization, especially in cases of duodenal ulcer. In a large series he reports that 41 per cent of the proved positive errors occurred in patients with duodenal ulcer in whom the gall bladder was found objectively normal at operation. Again, Hines (14) records 90 cases on which gastric analyses were made; eight were found with achlorhydria, revealing abnormal gall-bladder shadows, while in seven no shadows were present. He also cites three cases of achylia in which the intravenous test failed to visualize the gall bladder. However, Davis and Talley (15) do not confirm these findings.

There are practically no contra-indications to the use of this method of diagnosis by the oral procedure. Jaundice is not a contra-indication, and, in our experience, no ill effects have been observed in the many cases in which this test was utilized. Pregnancy is not considered a contra-indication inasmuch as the dye produces no ill effect upon either the fetus or the mother.

It is my purpose in this communication to analyze the data obtained in a series of 500 cases of suspected gall-bladder disease and evaluate the reliability of the test.

Of the 500 cases, cholecystographic studies yielded the following: 287 cases revealed abnormal findings and were diagnosed as pathological, while 213 were diagnosed as normal. The gall bladder filled in 358 cases, 116 of which filled poorly and 242 filled well. In 142 cases the gall bladder failed to fill. In 57 instances gallstones were found, 30 of which were of the negative type and 27 of the positive type. In 302 cases of filled gall bladders, 208 contracted normally, 46 abnormally, and in 47 the vesicle shadow was absent following a fatty meal.

Eighty-six (or 17.2 per cent) of the cases came to operation; in 81 (or 94.2 per cent) the diagnosis was proven correct. Of the 81 proved operative cases, 68 were pathological and 13 were normal. In five instances an error of diagnosis was made; in three of the five instances the diagnosis of pathology was made on poor filling of the gall bladder, and in the other two the error was due to faulty interpretation.

Of the 86 operative cases, 37 showed an absence of the gall-bladder shadow in the 16-hour examination. At operation, 30 of these revealed stones, and in 7 cholecystitis was found. Of the 49 filled gall bladders which came to operation, 24 revealed stones, 7 cholecystitis, and 18 were found to be nor-

mal. It is also of interest to note that of the 49 cases of filled gall bladders, the roentgen diagnosis of pathology was made in 20 instances on poor filling, in 7 on negative stone shadows, and in 6 on positive stone shadows. Normal findings were noted in 16 cases.

It is obvious from these findings that the highest percentages of correct diagnoses were confirmed in the cases which showed evidence of stones and in those which showed an absence of the gall-bladder shadow. The few errors which do occur are usually in the poorly filled and in the normal cholecystographic tests.

Jaundice occurred in 12 cases and in every instance the gall bladder failed to fill. Robins and Goldberg (9) cite 9 instances of catarrhal jaundice which revealed no shadow, and on re-examination, after the termination of the jaundice, some of the cases showed normal filling of the gall bladder.

Vomiting occurred in 84 (or 16.8 per cent) of our cases. In no instance could vomiting account for the non-filling or poor filling of the gall bladder, regardless of the time when the vomiting occurred, provided the full dosage had been taken. Occasionally a denser shadow was noted in cases that vomited. Diarrhea occurred in but 30 instances in this series.

CONCLUSIONS

1. Oral cholecystography is a reliable test in the diagnosis of gall-bladder disease.
2. Eighty-six cases came to operation; of these, a total correct diagnosis was made in 94.2 per cent.
3. The highest percentages of correct diagnoses occurred in cases of stones and in the gall bladders that failed to fill.
4. The diagnostic errors occurred in the cases with poor filling or faint shadows.
5. A normal cholecystographic appear-

TABLE I

500 Cases	287 Pathological 213 Normal
358 Gall bladders filled	242 Filled well 116 Filled poorly
142 Gall bladders failed to fill	
57 Cases revealed stones	30 Negative stone shadows 27 Positive stone shadows
302 Filled gall bladders	209 Contracted normally 46 Contracted abnormally 47 Absent

TABLE II

Operations, 86 cases (or 17.2 per cent)	Correct, 81 (or 94.2 per cent)
Errors, 5 cases (or 5.8 per cent)	3 Poorly filled 2 Faulty interpretation
37 cases showed an absence of gall-bladder shadow in 16 hours	
Operation revealed	30 Stones 7 Cholecystitis
49 cases with filled gall bladders	
Operation revealed	24 Stones 7 Cholecystitis 18 Normals
Roentgenologically, the 49 cases revealed	
20 Cases poorly filled	16 Normals 6 With positive stones
7 With negative stones	

ance of the gall bladder may in a very small percentage of cases represent a false normal.

6. With proper roentgen technic and interpretation, the diagnostic errors may be minimized.

7. Although a high percentage of correct diagnoses of gall-bladder disease is revealed by means of cholecystography, this method of examination must be considered in the same light as any other laboratory test—that is, in conjunction with the clinical data.

REFERENCES

(1) KIRKLIN, B. R.: Boston Med. and Surg. Jour., Feb. 9, 1928, CXCVII, 1487.
(2) GRAHAM, EVARTS A., and COLE, W. H.: Jour. Am. Med. Assn., Feb. 23, 1924, LXXXII, 613.
(3) CASE, J. T.: Jour. Am. Med. Assn., Jan. 26, 1929, XCII, 291.
Idem: Ann. Surg., February, 1929, LXXXIX, 222.
(4) PLUMMER, W. A.: Cited by KIRKLIN, B. R., *loc. cit.*
(5) GRAHAM, EVARTS A.: Surg., Gynec. and Obst., February, 1927, XLIV, 153.
(6) CASE, J. T.: Trans. Western Surg. Assn., 1928.
(7) LOCKWOOD, I. H., and SKINNER, E. H.: RADIOLOGY, July, 1928, XI, 7.
(8) HARDMAN, T. G.: British Med. Jour., March 9, 1929, I, 437.
(9) ROBINS, S. A., and GOLDBERG, B. I.: New England Jour. Med., July 18, 1929, CCI, 114.
(10) LORD, F. T.: New England Jour. Med., Oct. 18, 1928, CXCIX, 773.
(11) MORRISON, THEODORE H., and FELDMAN, MAURICE: Ann. Clin. Med., October, 1926, V, 330.
(12) FRIEDENWALD, JULIUS, FELDMAN, MAURICE, and KEARNEY, FRANCIS X.: RADIOLOGY, July, 1927, IX, 68.
(13) EUSTERMAN, G. B.: Trans. Am. Gastro-enterological Assn., 1927, 221.
(14) HINES, L. E.: Jour. Am. Med. Assn., June 30, 1928, XC, 2099.
(15) DAVIS, D., and TALLEY, D. D., JR.: Jour. Am Med. Assn., Jan. 12, 1929, XCII, 110.

THE CLINICAL SIGNIFICANCE OF ROENTGENOLOGIC FINDINGS OF THE NON-MALIGNANT COLON[1]

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THE increasing literature on the colon has brought forth many views and ideas regarding the roentgenologic aspects. The clinical significance of these findings has been open to much debate. Many authors have elaborated on the abnormalities of the colon—congenital and acquired—and have tried to attach increasing clinical significance to the evidence presented. There may be some substantiation for their arguments, but I have not been overwhelmed by their points of view. Many clinical entities which were formerly unlabeled are now ascribed to the "cecum mobile," the "sigmoid mobile," and the "markedly prolapsed transverse colon."

Clinical manifestations, obscure as they may at times be, now fall into the category of colonic disease. I think the pendulum has swung too far in the present direction. What has transpired in these patients, apparently and formerly healthy, to produce the symptom-complexes? Has a mobile cecum, present since birth, associated with a normal development, suddenly become a potent factor, or is it, as might more rationally be suspected, just mirroring what is going on in the mechanism as a whole? I grant you that abnormalities and redundancies exist, but do they play the exalted rôle that many clinicians believe? Kantor has written at length on the variations from normal, quoting from statistics of his own carefully controlled observations. I do not doubt but that his observations are correct; however, I am not completely in accord with all of his conclusions regarding the abnormalities of the large bowel. I am, however, particularly interested in his observations on ileal stasis. That it exists is a common roentgenologic observation; its clinical significance, however, is still debatable. Personally, I believe that stasis here, with or without surging, is of definite clinical import. Many toxic manifestations may be referable to this part of the bowel. Kantor roughly summarizes ileal stasis as due to the following causes:

"1. Ileal stasis is commonly associated with mechanical obstructions due to kinks or adhesions (Lane, Jordan).

"2. Ileal stasis is commonly associated with acute or chronic appendicitis (Hurst, George, and Gerber).

"3. Ileal stasis is associated with insufficiency of the ileocecal valve (Case, Kellogg).

"4. Ileal stasis is associated with constipation, particularly in the proximal colon (Cole)."

The stasis due to inflammations in and about the appendix is especially interesting, and Kantor, like many others, finds it as a result of a previous appendectomy. That the appendix should be removed in acute conditions needs no elaboration. The removal of a so-called chronic appendix, with definite roentgenologic and clinical evidence, is open to some debate. Once the diagnosis is made, one should not rush to surgery. If you are convinced that it is an important part of a patient's clinical picture, and, after thorough dietary and medical management there is no improvement in the symptoms, one may be justified in advising the removal of the appendix; but the wholesale removal of chronic appendices based only on roentgenologic data may lead to many com-

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plications and especially to ileal stasis. This may prove very troublesome and give even more pronounced symptoms.

The colon as it exists is subject to its intrinsic nervous mechanism, with or without cephalic stimuli, to hematogenous and chemical stimulants, to the character of its contents, and disease *per se* of its walls. Many cases of constipation may be due to faulty diet, but to conclude that diet alone in its local action on the colon is the only factor needs more elaboration. Hypertonicity of the bowel is more often a part of systemic disease than a local disease of the colon. The same may be said of hypotonicity. How many patients are treated for colitis for years, with presumable roentgenologic evidence to support it, only to have careful examination of the gastro-intestinal tract reveal a proven case of achylia gastrica! The simple addition of hydrochloric acid to their regimen brings about normal bowel movements. The so-called vagotonic individuals need more than colonic therapy to rid them of their vagotonicity.

We often see bowel manifestations in systemic disease. The more recent interest in vitamin deficiencies and their associated colonic disturbances can well illustrate this point. Patients presumably thinking they are on a normal ration, are found, on closer scrutiny, to have an avitaminosis. The hypertonic bowel in thyrotoxicosis, with its associated diarrhea or constipation, is another example. How often we are called upon to examine a patient who has had long-continued treatment for colitis, because the roentgenologic findings are suggestive, and, on careful investigation, we find the patient a thyrotoxic one.

I have been particularly impressed with the method of drawing conclusions as to the functions and abnormalities of the bowel with different methods of examination. The downward progress of the contents seems a more logical method of investigation than the use of a barium enema when we are studying motility and abnormalities of function—how the bowel acts when full of contents under normal propulsion, rather than the evidence presented by a barium enema in a perfectly cleansed condition. Let me emphasize again that I am talking about disturbance of function. The observations at twenty-four, forty-eight, seventy-two, and ninety-six hours are more significant to me than the observations of a barium enema, and these should consist of both fluoroscopic manipulation and radiographic evidence. When I have such evidence I try to fit it in with the clinical picture, and study what has been going on in the patient as a whole to bring on this abnormal function. Therefore, to draw conclusions on just the findings in the bowel without a knowledge of the patient's condition may be a hazardous procedure. However, this same view of definite intrinsic or extrinsic involvement of the colon cannot be held in the same light. The organic disturbances other than malignancies and their roentgenologic evidences are of definite clinical import. Our understanding of ulcerative colitis—its extent and degree of changes—can be more accurately pre-operatively measured than before the advent of this evidence. The early changes in the bowel wall, the loss of haustral markings, the "feathery, moth-eaten" appearance of the column of barium, are very enlightening. To see the same bowel return to near-normal in those cases responding to therapy is very gratifying. The contour of the bowel in these long-standing cases of so-called mucous colitis presents definite roentgenologic evidence. The contour of the cecum in ileocecal tuberculosis, which was formerly known only at operation or necropsy, is now available. However, this evidence is only a link in the chain, because, in the absence of pulmonary tuberculosis, the diagnosis is indeterminate by roentgenologic evidence. A tuberculoma, retrocecal

appendix, appendiceal abscesses, mesenteric adenitis, carcinoma, and idiopathic infections are differentiated with difficulty and then only with clinical aid. However, irritability may be an early finding and subsequent appendectomy may result in sinus or fistula formation. Therefore, an irritable cecum may be of definite clinical import.

The presence of diverticulosis, either congenital or acquired, has assumed greater clinical significance. The association of arthritis with either local or multiple diverticula, with consequent long-continued retention, has been recognized. The removal of these diverticula at times has greatly influenced the course of the disease. The diverticula of the sigmoid, when localized, are of especial interest. I have seen cases which, when early, were benign, yet later, years after, showed evidence of malignant transformation. When these diverticula occur they should be looked upon as potential sources of carcinoma. Early, these cases as a rule show no evidence of occult blood in the stool, while later, as malignant transformation takes place, the occult blood becomes persistently positive. At this time the other clinical manifestations of malignancy present themselves. I particularly warn these patients that they should return for frequent clinical observations, so that their clinical picture may be carefully noted.

I have purposely left out of this discussion any mention of malignant conditions of the colon, because when they are suspected the patient should have the benefit of an exploratory operation, and I do not think this issue should be debated. Syphilis of the colon, if it exists, more often involves the rectum and may result in stricture formation. Neisserian involvement, with its external evidence, may be very confusing. The clinical and laboratory evidence in each of these conditions helps to differentiate it from other organic disease.

I have tried to express the clinical attitude toward these roentgenologic findings. I know many disturbances are attributable to the large bowel, but I often wonder whether or not the camouflage diagnosis of colitis in the absence of organic findings is a justifiable one; if patients who present redundancies are not often wrongly classified, and whether some systemic disease is not overlooked in our zeal to accept the roentgenologic evidence. Clinical diagnosis has far outdistanced our knowledge of colonic physiology. When we know more about the interpretation of these findings, we then—and then only—will make more accurate clinical diagnoses.

DISCUSSION

DR. SAMUEL BROWN (Cincinnati, Ohio): I wish to congratulate the author on his very valuable paper; but one thing I do not understand. Dr. Portis has emphasized the importance of the examination of the bowel from above, and yet every specimen he presented was taken from below.

DR. MAURICE FELDMAN (Baltimore): About 10 per cent of our examinations revealed colitis, in 500 cases of mucous colitis that we have reported. In making the examinations we have studied a large number of them by both methods, by the use of the barium meal and the colonic enema. We found in many cases a string sign in the lower bowel, which is very suggestive of this colonic condition. Frequently no sign could be found other than a feathering of the bowel, in mucous colitis.

In the diagnosis of carcinoma of the esophagus the liquid and semi-solid meal is necessary. Both will descend rapidly in ordinary cases. If we would use the semi-solid meal in all cases as a routine, I am sure we would find more early cases of carcinoma of the esophagus.

DR. H. A. CHAPIN (Jacksonville, Ill.): The importance of a careful study of the colon cannot be over-estimated. I believe the tendency of radiologists has been to under- rather than to over-examine gastro-intestinal cases. We permit the referring doctor or the patient to hurry us in our examination, and many times I think radiology falls into disrepute because we do not make a sufficiently long and careful study, and, possibly, check up on these cases.

DR. PORTIS (closing): I am glad to arouse some clinical interest, because that was my main reason for presenting the paper. I emphasized, when I was discussing the disturbances of function, and anomalies, that I was looking for function and not for pathology of the wall, and that I much prefer to use the downward progress of the column of barium as a means to this end. The slides were used purely to show evidence of organic disease and that is the reason that they are shown with the use of a barium enema. It is a common observation that when the purpose is to show defects of the gut, it is better to use a barium enema than to observe the downward progress in the barium meal given by mouth. I use the combined methods of observation in studying the colon, but, clinically, the important fact is that, other than as a study of organic disturbances of the bowel *per se,* the barium enema has not given reliable data. The term "colitis" is so misused—and there are no roentgenologic data to support it as a rule—that we cannot depend upon the roentgenologic evidence in making a diagnosis of the symptom-complex called "colitis." However, clinical diagnosis has far outdistanced our knowledge of colon physiology, and until it reaches the same level we will not know much more about the diseases of the colon.

Redundancies do exist, but what part do they play in the symptom-complex of the patient? It is purely a matter of conjecture on the part of the physician who tries to emphasize the importance of redundancy in producing the symptom-complex in that patient.

I do not believe that any one should accept the roentgenologic evidence as 100 per cent correct, but I would much rather trust to roentgenologic findings in or about the cecum in studying appendiceal disease than to rely merely on palpating the abdomen. How often have we thought that we palpated a high-lying appendix, while by roentgenologic evidence it is shown to be low down in the pelvis! The only accurate knowledge that we have to-day that pathology exists in or about the cecum is from roentgenologic evidence. We believe that the patient may have trouble there clinically, but the actual knowledge comes through the roentgenologist. That is why 24-, 48-, 72,- and even 96-hour observations of the cecum and bowel are of distinct clinical importance. Whether chronic appendicitis exists as such, as many clinicians believe, is not a matter for us to debate this afternoon. However, chronic appendicitis does exist in many cases, and, with combined clinical and roentgenologic evidence, it may be justifiable to advise the removal of the appendix. However, very often the evidence gained in the fluoroscopic room is more important than the clinical evidence. On this basis it may be justifiable to remove a diseased appendix even though the clinical evidence is lacking.

PHYTOBEZOAR[1]

By R. P. POTTER, M.D., Marshfield Clinic, MARSHFIELD, WISCONSIN

THE term "phytobezoar" is derived from the Greek word φυτον, meaning *plant,* and the Persian word "bezoar," having reference to the concretion found in the stomach and intestines of animals. Therefore, the food-ball which is occasionally found in the human stomach is called a "phytobezoar."

The phytobezoar consists of the skin, seeds, and fibers of fruit or vegetable matter, such as persimmons, prunes, salsify, and celery. The hair-ball frequently found in the stomach is also a bezoar, and may be either of two varieties—one made up solely of hair is called a "trichobezoar," and one made up of hair and food is called a "trichophytobezoar."

The trichobezoar, or hair-ball, is quite common, a large number being reported. The phytobezoar, or food-ball, is not common, only five cases being recorded up to 1923. In 1923 W. E. Hart, of Decatur, Illinois, reviewed the five cases and to them he added eight, with their case histories. Since his report five others have been recorded, not including the one I am reporting at this time.

Fig. 1. Negative shadow in lower part of stomach where mass displaces the barium meal.

The mode of formation is not definitely known, but it has been suggested by Porter and McKinney that in cases due to the eating of persimmons the high percentage of

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gums and pectin was responsible. The persimmon contains 14.1 per cent gum and 7 per cent pectin.

The trichobezoar and trichophytobezoar are evidently formed gradually by more material being added from time to time. The phytobezoar, however, seems to be formed at one meal and remains in the stomach without becoming any larger.

The symptoms are those of a severe gastro-enteritis occurring soon after eating or a few hours later, though in some cases not occurring until a day or two later. After the acute symptoms have subsided the patient may feel fairly comfortable, but rarely returns completely to normal: there may be some pain in the epigastric region or referred to the groin or kidney region, a sense of fullness or distress in the epigastrium, and other symptoms simulating gastric ulcer or gall-bladder disease. Usually there is not much loss of weight, in spite of the fact that the condition may have existed for weeks, months, or even years.

In the diagnosis, a carefully taken history is important. On examination, there may be detected in the epigastric region a freely movable tumor which is not tender on pressure and which may change its location upon changes of the position of the patient. The blood, urine, and gastric analyses are not affected in uncomplicated cases.

When a barium meal is given with the patient erect, a negative shadow or apparent filling defect will be noted in the most dependent portion of the stomach, and when a sufficient quantity of the meal has been taken the filling defect will change position by floating to the top of the fluid and resting just under the gas bubble. By placing

Fig. 2. Negative shadow just below the gas bubble, the mass having floated to this position.

the patient on the table with the hips elevated the mass can be floated toward the pylorus.

Mistaken diagnoses have been common. A phytobezoar has been diagnosed as floating kidney, carcinoma, gastric ulcer, tumor of the stomach, hair-ball, movable spleen, polyp, and adenoma. In one case reported by Hart, three series of X-ray examinations did not reveal the phytobezoar and the surgeon did not find it while doing a gastroenterostomy on the patient. Later this patient developed an obstruction of the small intestine caused by the phytobezoar passing through the opening made by the gastroenterostomy and becoming lodged a short distance beyond it.

Gastric ulcer was found in two of Hart's cases and in our own case, the ulcer in each apparently having existed before the phytobezoar was formed. These food-balls may be multiple, as is shown in another of Hart's cases, in which a phytobezoar was found in the stomach and another—a smaller one—near the ileocecal valve, causing obstruction of the small intestine.

The treatment is essentially surgical, although other methods have been tried.

In the case of Mills and Simpson, reported by Hart, hydrochloric acid was given on account of achylia gastrica, and, a few days later, hard, dark masses were passed in the stools. In the case reported by Outten, manipulation and breaking down of the mass was accomplished. The giving of hydrochloric acid probably will not be successful in the majority of cases, because most of them have a high or normal acidity, and, on account of the frequency of gastric ulcer with phytobezoar and also the liability of intestinal obstruction being caused by these masses, I think the method of breaking them down by manipulation is contraindicated.

The surgical procedure consists in incision and removal in uncomplicated cases; in those showing gastric ulcer the ulcer is excised and the phytobezoar removed through this opening. The surgeon must bear in mind that with the patient on the operating table the mass is liable to be found in the cardiac end of the stomach, and also that multiple masses may be present.

CASE REPORT

Case 1. Mr. A. N., aged 57, laborer, patient of Dr. W. F. Cowan, Stevens Point, Wisconsin, and Dr. K. W. Doege, Marshfield, Wisconsin, was referred for roentgenologic examination, with a history of having had, for three weeks, severe intermittent cramp-like pains in the epigastric re-

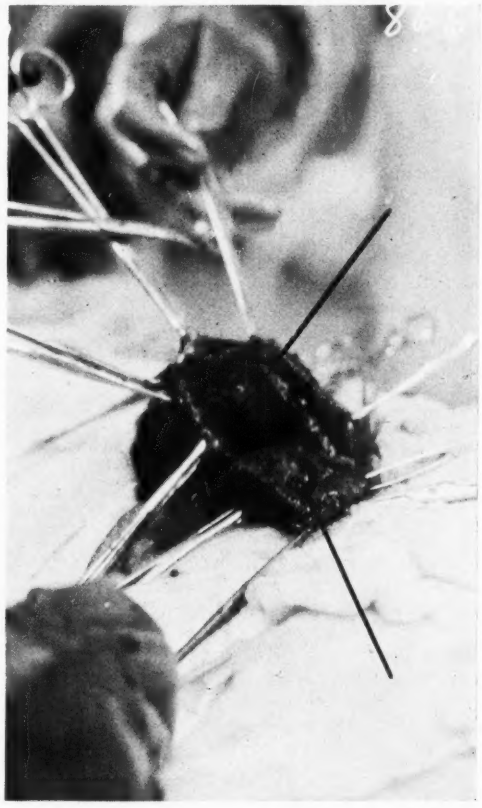

Fig. 3. Ulcer partly excised, its crater showing at the bottom of the picture. The phytobezoar is seen in the stomach.

gion and a constant feeling of fulness and distress, with belching of sour liquid but no vomiting. He had a poor appetite and had lost some weight. Chemical analysis showed free hydrochloric acid 47, total acidity 64.

Roentgenologic examination with the

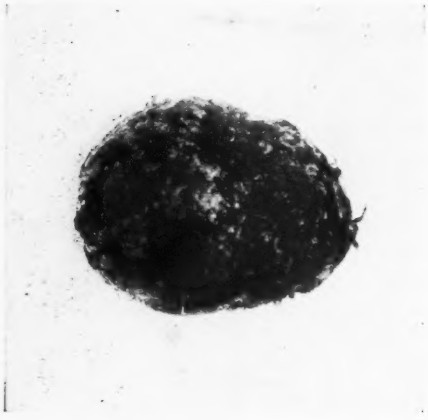

Fig. 4. Phytobezoar (about size of a lemon) after its removal.

screen and a barium meal on February 7, 1929, revealed a large filling defect in the antrum. As more barium meal was given the apparent filling defect was seen to move toward the upper part of the stomach, remaining just below the gas bubble. The patient was then placed on the table with the feet elevated and the head lowered, and in this way we were able to float the mass back to the pyloric end of the stomach. A large ulcer was also found on the lesser curvature. We could not obtain a definite history of the time of onset or the article of food which was responsible for the phytobezoar.

A roentgenologic diagnosis of large gastric ulcer and phytobezoar was made and on February 11th the patient was operated upon by Dr. K. W. Doege, the ulcer excised, and the phytobezoar removed through the opening made by the excision of the ulcer.[2] The mass was nearly round, black in color; weight 61.5 grams; circumference 18 centimeters. The crater of the ulcer was 2½ centimeters in diameter. The patient's recovery was uneventful.

CASES REPORTED SINCE 1923

Case 2. Clinic of Dr. Joseph W. Larimore, Barnes Hospital, Washington University Medical School, St. Louis, Mo. Female, aged 46, widowed. Chronic indigestion for eight months. Symptoms were like those of gallstone colic, but the gall bladder had been removed. Diagnosed by X-ray as benign adenoma. Operation: removal of phytobezoar, 5 by 3 centimeters.

Case 3. Clinic of Dr. Joseph W. Larimore. Male, aged 20, single, miner. Distress for twelve months, coming on after eating persimmons while on hunting expedition. X-ray revealed movable tumor size of lemon. Symptoms were like those in duodenal ulcer.

Case 4. Patient of Dr. D. L. Garrett, Tulsa, Okla., male, aged 42, fishing-rod maker. Had eaten freely of persimmons eight months previously. Operation on June 17, 1927. Phytobezoar, 9.5 by 4.2 centimeters, weight 68 grams.

Case 5. Patient of Dr. William B. Porter and Dr. J. T. McKinney, of Roanoke, Va., male, aged 35. Admitted on December 18, 1925. Gastric symptoms for thirteen months. Said that while hunting he had eaten freely of persimmons. He became sick and nauseated a few hours later, vomited, but did not vomit any of the persimmons. X-ray examination showed negative shadow in stomach. Phytobezoar diagnosed. Operation on December 24, 1925. Phytobezoar, weight 59 grams.

[2]About 120 feet of 16 mm. moving picture film was shown when this paper was read. The film was made up of the X-ray films, showing the ulcer and movable mass in the stomach, the important steps in the operation—the stomach laid open, the excision of the ulcer, and the removal of the phytobezoar, as well as the specimens after their removal.

Case 6. Patient of Dr. W. O. Upson, Battle Creek Sanatorium, Battle Creek, Mich., Mr. W., aged 42, farmer. Gastric distress for four or five years; attacks recently increased in frequency and severity. Roentgenologic diagnosis was a free tumor in the stomach. Operated on by Dr. J. T. Case. Bezoar (two inches in greatest length) removed. This patient was an inveterate tobacco-chewer. The specimen was examined by Dr. Francis Carter Wood, who claims to have found a persimmon seed in the center.

REFERENCES

1. GARRETT, D. L.: Phytobezoar Diospyri Virginianæ: Case Report. Jour. Oklahoma Med. Assn., March, 1928, XXI, 64.
2. HALLAS, E. A.: Ueber Schellackconcremente im Magen und Duodenum. Berl. klin. Wchnschr., 1914, LI, 440.
3. HART, W. E.: Phytobezoars. Jour. Am. Med. Assn., Dec. 1, 1923, LXXXI, 1870.
4. KING, W. P.: Cited by OUTTEN, W. B., *loc. cit.*
5. LARIMORE, JOSEPH W.: Phytobezoar. Med. Clinics North America, September, 1927, XI, 499.
6. OUTTEN, W. B.: A Case of Double Gastrolith Removed by Gastrotomy: Recovery: Death by Phthisis Three Months Afterward. Med. Fortnightly, Aug. 15, 1894, VI, 445.
7. PEPLE, W. LOWNDES: Globus Diospyri, Virginianæ Seminum: Report of a Case. Virginia Med. Monthly, January, 1922, XLVIII, 596.
8. PORTER, WILLIAM B., and MCKINNEY, J. T.: Phytobezoar Diospyri Virginianæ, with Report of a Case. Am. Jour. Med. Sci., November, 1926, CLXXII, 703.
9. QUAIN (for BUCKNILL): The Stomach of an Insane Patient Filled with Cocoanut Fiber, which Caused Death by Perforation of this Viscus. Trans. Path. Soc. London, May 16, 1854, V, 145.
10. SCHREIBER, JULIUS: Ueber einen Phytobezoar im Magen einer Frau und dessen Diagnose (Operation, Heilung). Mitteil. a. d. Grenzgeb. d. Med. u. Chir., 1896, I, 729.
11. UPSON, W. O.: Roentgenologic Findings in a Case of Phytobezoar. RADIOLOGY, January, 1925, IV, 49.

DISCUSSION

DR. H. B. PODLASKY (Milwaukee, Wisc.): I want to show some slides of a phytobezoar case, a persimmon-seed tumor, adding another to those reported in the literature. In the Spring of 1929, Dr. Potter presented his case of persimmon-seed tumor, the same one he showed us to-day. I wish to acknowledge my debt to him for having been able in my own work to recognize a case of this type.

The patient I examined was referred to me by Dr. A. J. Patek, of Milwaukee, in the Fall of 1929. Arriving in the office at a period in which I usually make my fluoroscopic examinations, I was asked by my assistant to view some films which had been made of the stomach in this case at the morning examination.

It is rather strange how the mind is impressed or tricked into remembering some one or two factors which are helpful in directing one along the right path to a diagnosis. Dr. Potter's and Dr. Hart's descriptions of the shifting character of the stomach defect caused by this tumor had impressed themselves upon me as probably the most significant finding by which one first becomes aware of the possible presence of such a condition as here reported.

Dr. Hart and Dr. Potter state that the tumor mass can be made to shift or float about in the stomach while making the fluoroscopic examination. Having first observed the shifting character of the stomach defect in the films on my case, I made special preparation for the screen examination by taking a longer period than usual to prepare my eyes for visualization of the screen image. I confess I am not as keen as most in screen examinations. In spite of the preparation just referred to, I failed in recognizing the defect with the same ease on the screen as I had done when I briefly viewed the films. This may be a point to bear in mind and may account for the rather infrequent reports of this type of case from the southern part of this country where persimmons are frequently eaten.

Dr. W. E. Hart, of Decatur, Illinois, reported eight cases of this type in 1923, his article appearing in the *Journal of the American Medical Association* (Dec. 1, 1923, LXXXI, 1870). He states that the tumor mass is usually found in the antral area at

the beginning of the examination, but can later be made to shift or float. My slides will show the antral defect changing, however, in size and shape. [Four slides were shown.]

My patient left Milwaukee and was re-examined and operated upon at the Mayo Clinic. I have a letter from Dr. Kirklin with me stating that the mass removed was a persimmon tumor. This case, then, is the twentieth of this type to be reported. About four years ago the patient complained of symptoms referable to the gastro-intestinal tract; two years ago he was operated upon and gallstones were removed from the gall bladder.

In reference to differential diagnosis, it is important to obtain a history of persimmon ingestion. Roentgenologically, the defect in the stomach differs from that produced by cancer. In phytobezoar, the defect does not remain constant as to size, shape, and position, as in cancer. My patient was 42 years of age, a well nourished male of athletic proportions. There was no loss of weight, as you would expect to find in cancer, nor was there any tenderness to pressure over the stomach. Even in tumors of the stomach such as fibroma, angioma, and papilloma, the filling defects produced are much more constant than those produced by phytobezoar.

Dr. J. D. Camp (Rochester, Minn.): I was fortunate enough to screen the patient whom Dr. Podlasky has discussed, when he came to the Clinic. The screen findings corresponded exactly with the defects which Dr. Podlasky has shown in the slides. Something was said about a question of there being two tumors. I think that can be explained by the fact that the surgeon broke the tumor in delivering it from the stomach. Of course, the single mass readily accounts for the defect which Dr. Podlasky has shown.

Dr. Potter (closing): Dr. LeWald has discussed the subject of hair-balls, a great number of which have been found. He cited the case of a very brilliant woman in England who had several operations for the removable of recurrent hair-ball, occurring about one year apart. We have a very large hair-ball, about the size of the one shown by Dr. LeWald at one of the former meetings. This was removed from a woman's stomach about twenty-seven years ago, before the use of the X-ray in Marshfield.

Many laboratory rats and mice have hair-balls. Some are single but many are multiple, accounted for by the fact that the hair which the animals shed becomes mixed with the food on the floor of their cages and thus finds its way to the stomach.

An important point which I wish to emphasize, and which I believe will help to differentiate between hair-ball and food-ball, is that the food-ball will float, but the hair-ball will not.

The films shown by Dr. Podlasky reveal multiple negative shadows, indicating that the mass had been broken up before his examination. It is in such a case that intestinal obstruction may occur, caused by one of these small masses becoming lodged at some point in the small intestine.

I neglected to state that in our case the surgeon referring the patient for X-ray examination said that he thought he could palpate a mass in the epigastrium, but that it was only for an instant. When opening the stomach, the surgeon should thoroughly investigate the upper portion. One writer has suggested that the stomach should be opened wide enough to admit the hand.

X-RAY THERAPY IN THE TREATMENT OF ACUTE GONORRHEAL ARTHRITIS[1]

By IRA I. KAPLAN, B.S., M.D., Attending Radiation Therapist,
Bellevue and Beth Israel Hospitals, NEW YORK CITY

From the Urological Service, Dr. A. R. Stevens, Director, and the Radiation Service, Bellevue Hospital, New York City

IN a large general hospital such as Bellevue, the Radiation Therapy Department is often called upon to assist in the treatment of lesions usually cared for otherwise. Among the very large number of gonorrheal patients admitted to the urological service at Bellevue, there are many suffering from extra-genital lesions. Quite frequently this takes the form of arthritis of one or more joints. Chetwood (1) states that gonorrheal rheumatism is the most important complication. Often it is for the relief of this symptom that the patient enters the hospital, and it is because the usual methods of treatment have failed in relieving these patients that the radiation therapist is called upon for aid.

Radiation therapy has been used with beneficial results in inflammatory lesions, and has proved very efficacious for tuberculous joint conditions. At the recent International Congress of Radiology, in Stockholm, good results were reported in the treatment of arthritic joint conditions by radiation. Although text-books on urology such as Young's, Lowsley's, or Chetwood's make no mention of radiation therapy for the treatment of gonorrheal arthritis, Wetterer (2), in 1921, reported treating such a case by X-rays with good results, and Guhrauer (3), in 1927, reported 23 such cases treated by him with good results. Grauer (4) reported good results in six cases of arthritis treated with roentgen rays. Sordello (6) has reported excellent results in six cases treated by mild doses of X-rays. He has stated, too, that treatment of one of the affected joints caused a recession of the symptoms in other joints. Good results were likewise reported with this therapy by Schulte (5) in April, 1927.

The patients referred to us were those with acutely swollen and excruciatingly painful joints. The result of treatment with radiation could be readily noted, the sedative effect usually occurring within twenty-four hours. In cases in which relief was obtained, the results were gratifying and fully justified the further use of this form of therapy.

Whatever may be the explanation of the action of radiation on normal and pathological tissues (and numerous suggestions have been offered), its action on inflammatory tissues requires a different explanation. Hyperemia and lymphocytosis do not sufficiently account for the reaction. Since the condition is not one which lends itself to autopsy or detailed microscopic examination, we must rely mainly on clinical observations.

We find that therapeutic X-radiation in the usual dosage does not destroy normal tissue, and, while a large dose of radiation will clinically increase the inflammatory process, a properly administered dose apparently retards further inflammatory growth and brings the process to a more rapid resolution. This we know, that direct action of radiation on the bacterial agent in the inflammatory area has been disproved.

Colwell and Russ (7) have shown that the common pathological forms appear to be highly resistant to X-rays, and they

[1]Read before the Radiological Society of North America at the Fourteenth Annual Meeting, at Chicago, December 3–7, 1928.

quote Murphy and Ellis to the effect that the resistance to bacterial infection by the body is increased by X-rays. This result they attribute to the action of the rays upon the lymphocyte-forming tissues. Gonococci evidently are insensitive to radiation in normal therapeutic doses, but the reaction on the tissues affected may be the production of some sort of bactericidal action or contrabacterial action, causing a cessation of the inflammatory process. Such action may result from the reaction of the lymphocytic tissue of the synovial membrane to the X-rays. Pordes (8) believes that X-rays have a selective action on white cells. However the action or reaction to radiation may be explained, clinically there is a remarkable subsidence of the acute symptoms and relief is rapid and permanent. The radiation, as given, does not cause fibrosis or any material change in the joint.

During the past year we have treated 68 cases (62 males and 6 females); of these, 26 complained of single joint involvement, and 42 of involvement of more than one joint. There were 65 white and 3 Negro patients. Of these cases, 52 had received treatment before being submitted to radiation. The joint most frequently involved in the series of cases treated by us was the knee. Of these cases, in 37 the knee alone was involved, and in 4 cases the elbow alone. The oldest patient was 53 years of age and the youngest was 17. In cases in which multiple lesions were present, three areas were treated at one session. In 17 cases, but one treatment was given to relieve the condition.

The technic used was high voltage X-rays, with filtration of 0.5 millimeter copper and 1 millimeter aluminum. The target distance was usually 30 centimeters, and the size of the field treated 9×12. Most frequently 25 per cent of the skin erythema dose was given to each area, but in cases in which multiple lesions were treated at one session a 20 per cent dose of the skin erythema on each area was administered. While most cases reacted well on the first treatment, several received two or more subsequent treatments before complete relief was obtained. The knee and elbow involvements reacted more quickly than did the lesions of the smaller joints.

While X-rays used therapeutically are not being suggested here as a panacea in joint diseases, in acute and refractive gonorrheal arthritis they have, with us, proved quite efficacious in relieving the acute symptoms of the lesion, and not infrequently in bringing about permanent relief. The results occur early. Radiation therapy may be used either alone or in conjunction with the usual methods of treatment. There are no contra-indications to the use of this form of therapy.

BIBLIOGRAPHY

(1) Chetwood, Charles H.: The Practice of Urology: A Surgical Treatise on Genito-urinary Diseases, Including Syphilis. William Wood & Co., New York, 1927.
(2) Wetterer, Josef: Strahlentherapie, 1921, XII, 469.
(3) Guhrauer, H.: Strahlentherapie, 1927, XXVI, 275.
(4) Grauer, S.: Strahlentherapie, 1928, XXIX, 303.
(5) Schulte, G.: Münch. med. Wchnschr., April 29, 1927, LXXIV, No. 17, p. 717.
(6) Sordello, Attilj: Archivio di Radiologia, November-December, 1926, II, 995. Abstracted in Am. Jour. Roentgenol. and Rad. Ther., October, 1927, XVIII, 393.
(7) Colwell, Hector A., and Russ, Sidney: Radium, X-rays, and the Living Cell, with Physical Introduction. G. Bell and Sons, London, 1924.
(8) Pordes, Fritz: Strahlentherapie, 1927, XXIV, 73.
(9) Lowsley, Oswald S., and Kirwin, Thomas J.: A Text-book of Urology. Lea & Febiger, Philadelphia, 1926.
(10) Young, Hugh H., and Davis, David M. (with the collaboration of Franklin P. Johnson): Young's Practice of Urology, Based on a Study of 12,500 Cases. W. B. Saunders Company, Philadelphia and London, 1926.

CASE REPORTS AND NEW DEVICES

BRAIN ABSCESS FROM WELCH BACILLUS INFECTION

CASE REPORT

By V. W. MAXWELL, M.D., JACKSON, MISSISSIPPI

Patient, a white boy, aged 17 years, was struck on the head in the right parietal region by the sharp end of a file. The injury inflicted was thought at the time to be a very small scalp wound. Five days later a paralysis of the left arm and leg was noted. At the same time a mild convulsion developed. X-ray films made of the patient's head at this time in the anterior-posterior and lateral positions revealed the abscess, as shown in Figures 1 and 2. An operation done over this portion of the skull revealed a large amount of pus and gas, which spurted out when the skin flap was turned back. In trephining the skull at this point a large amount of pus and gas escaped from the dura. The pus, on being cultured, showed prompt growth of the bacillus of Welch. The patient died two days later without having regained consciousness.

Fig. 2. Anterior-posterior view, five days after injury.

Fig. 1. Lateral view, showing abscess.

A MILLIAMPERE MINUTE DOSE TABLE FOR SUPERFICIAL THERAPY

By I. S. TROSTLER, M.D., F.A.C.R., F.A.C.P., CHICAGO

Having been asked five times within the last month for a safe dose table for skin and superficial roentgen therapy, and thinking that others may find such a table useful, I herewith offer the one which I have worked out and have used for several years.

VOLTAGE		FILTRATION				
Kilovolts peak	Spark gap (blunt points)	Unfiltered	0.5 mm. Al	1.0 mm. Al	2.0 mm. Al	3.0 mm. Al
68	3 inches	40 ma./min.	72 ma./min.	96 ma./min.		
78	4 inches	30 ma./min.	50 ma./min.	70 ma./min.		
90	5 inches	26 ma./min.	40 ma./min.	54 ma./min.		
100	6 inches	20 ma./min.	30 ma./min.	40 ma./min.	60 ma./min.	75 ma./min.
112	7 inches	18 ma./min.	24 ma./min.	32 ma./min.	48 ma./min.	60 ma./min.
125	8 inches	15 ma./min.	21 ma./min.	27 ma./min.	38 ma./min.	45 ma./min.

The doses are for the average skin, and have all been proven safe. For light blondes and thin-skinned types, 75 per cent (or less) of the doses given should be applied.

More than one unfiltered dose should never be applied to any one skin area.

The dosage given will produce one skin unit (epilation) at 40 cm. (16 inches) anode skin distance.

DEFECTS IN MEMBRANOUS BONES, EXOPHTHALMOS, AND DIABETES INSIPIDUS ("CHRISTIAN'S" SYNDROME)

CASE REPORT

By T. P. ROTHNEM, M.D., Fargo, North Dakota

The following case is reported because of the rarity of this condition, and that the conclusions from pathological reports be considered with reservation when this syndrome is present.

D. F., a boy aged two years, came under our observation, February 20, 1925. He complained of a painful shoulder which had been giving him distress for a week. The pain radiated down the arm to the end of the fingers. A swelling had been noticed at the back of the shoulder a few days before. The family history gave no evidence of tuberculosis or syphilis. The child had not had any of the usual diseases of childhood, nor was there any history of former injury.

Physical examination showed a fairly well-nourished child, but somewhat pale. Head, neck, and cardio-respiratory region negative. Over the left scapula there was a

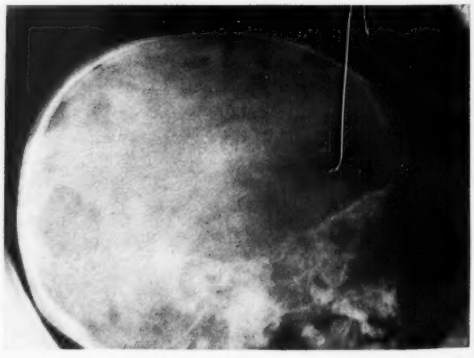

Fig. 1. Several irregular lesions varying in size, the largest one being in the left temporal region.

circumscribed swelling, with tenderness, heat, and fluctuation. The child refused to abduct the arm. The abdomen seemed rather large, with visible superficial veins: no abnormal palpable findings. The lumbar region was covered with a papular and erythematous rash. The limbs appeared normal.

Laboratory findings: Urine negative; hemoglobin 45 per cent; red cell count 4,000,000; white cell count ranging between 13,350 and 23,500; polynuclear neutrophiles 58 per cent; small lymphocytes 27 per cent, and large mononuclear 3 per cent; eosinophiles 1 per cent; Wassermann test negative; Bence-Jones protein test negative.

Radiographic study of the skeleton at various times revealed extensive defects in the skull bones, left scapula, ribs, lower end of humerus, and middle third of shaft of left femur. The scapula and skull showed the most extensive and progressive involvement (Figs. 1, 2, 3). The lungs appeared normal at all times.

A few days after the first examination, an incision was made over the dorsal part of the left scapula. This was curetted and a specimen of tissue sent to the University of North Dakota Public Health Laboratory, the report of the pathologist being "tuberculous granulation tissue." Seven months later a biopsy was made, removing tissue from one of the fluctuating areas in the skull. This specimen was sent to the pathologist at the University of Minnesota, the report stating the tissue to be that of giant-cell tumor.

We decided to report the case to the Registrar of the National Committee on Bone Sarcoma. The opinions and diagnoses of the three pathologists on the Registry are as follows:

CASE NO. 697, D. F.

(1) "In spite of Dr. B.'s histologic opinion, the location of these lesions, their multiplicity, the cortical involvement in their neighborhood, and the gross description, make me feel that the lesion is a low grade inflammation, probably tuberculosis or syphilis."

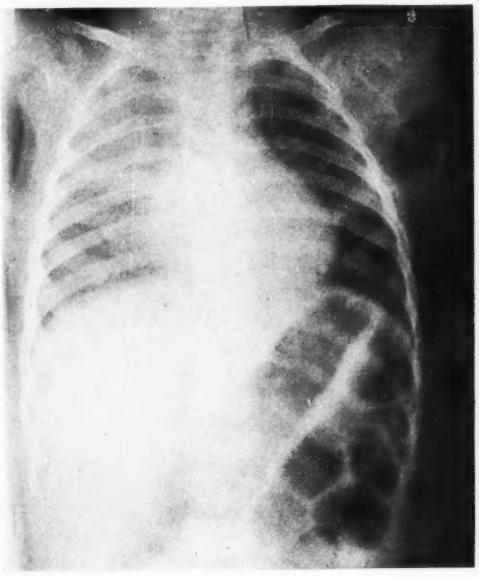

Fig. 2. The lungs appear normal. The left scapula shows extensive involvement.

(2) "Multiple infectious lesions; would suspect syphilis."

(3) "Multiple infectious lesion."

Seven months after the onset, the child developed a marked exophthalmos of the right eye. This persisted to a variable degree throughout the disease, and, in February, 1926, the exophthalmos became very pronounced. The child suffered considerably from the eczematous condition of the lumbar region which had now extended towards the shoulders, and over the abdomen and anterior chest (Fig. 4).

After a month's treatment with roentgen irradiation, the skin condition disappeared. Roentgen irradiation was also given to the different areas of bone involvement, and in June, 1926, the mother stated that at times the exophthalmos would disappear. The

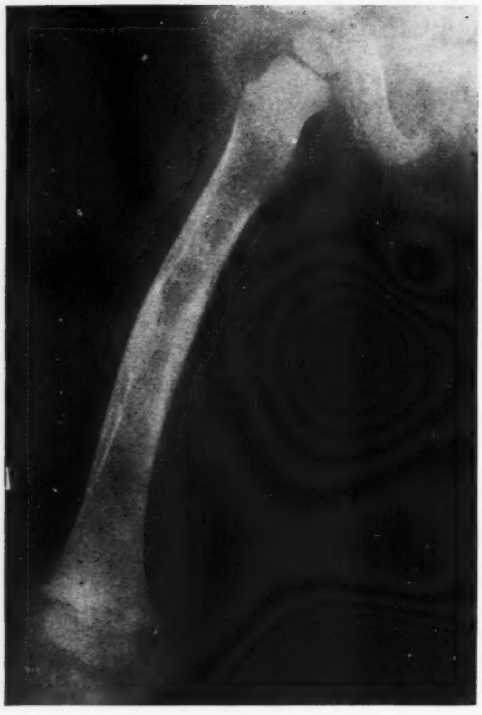

Fig. 3. The middle third of shaft has a medullary porosity, with sclerosis of cortical tissue.

Fig. 4. The eczematous, papular, and pustular condition of the back, and the post-operative scar over the left scapula.

radiographs at this time also showed evidence of increased bone density at the irregular margins in the skull lesions—likely an attempt at bone repair.

The information was later obtained that the child drank a large amount of water and would often urinate about every hour, the mother expressing her belief that the large abdomen was due to the excessive water-drinking. The boy was fairly active most of the time and not confined to bed. In March, 1927, he died suddenly without any apparent illness, having the previous day been playing about. Autopsy was not permitted.

The pathological reports from five pathologists varied, the predominating opinion being that it was a chronic inflammatory process. The presence of giant cells in considerable numbers was undoubtedly a factor. In this case we had also an involvement of the middle third of the shaft of the left femur, and giant-cell tumors have not been found in the shafts of long bones. Besides, there was considerable cortical bone thickening. Rowland, in his summary of reported cases, also mentions the numerous multinuclear giant cells present, but states that the chief characteristic feature is the presence of a large amount of lipoid in the cells. He considers this condition as "a generalized xanthomatosis, representing pathologic lipoid storage, or lipoid cell hyperplasia of the reticulo-endothelial system."

The clinical and anatomical findings in this case are in every respect so similar to those classified under the description of Christian's syndrome that it is deemed justifiable to place this in the same category.

THE TRACING OF FILMS TO REDUCE THE FIRE HAZARD

By M. A. LOEBELL, M.D., Bethesda Hospital, Zanesville, Ohio

We have been besieged during the past year by inspectors with suggestions for the storage of X-ray films, ranging from bomb-proof vaults twenty feet underground and a half-mile distant from the hospital, to concrete vaults on the roof of the institution, where, in addition to films, ether and other inflammable material must be stored.

The only films which need to be preserved, except the few for teaching purposes, are such as may be of medico-legal importance; all others may be destroyed as soon as the radiologist has rendered a written report.

To reduce the fire hazard in our hospital and private laboratory we have instituted the following procedure, which has proven very satisfactory to our surgical staff and acceptable in our local courts. It reduces the number of films which must be preserved, taking care of fractures, separations, filling defects, delineation of the bony structures, and others which will occur to the roentgenologist.

Tracings of radiographs are made upon transparent (onion-skin) paper in the following manner: An ordinary illuminating box is tilted at a convenient angle; film overlaid by paper is fastened under a clip. With pencil or pen, follow the outline of a sufficient portion of the subject to identify the structure, carefully outlining fractured ends and fragments. The radiologist points out the essential outline, any office or laboratory assistant, without special training, can make a good tracing in a short time. Occasionally, with poor negatives, it is necessary to retouch portions of the outline of the radiograph with a soft pencil to make tracing easier and more accurate.

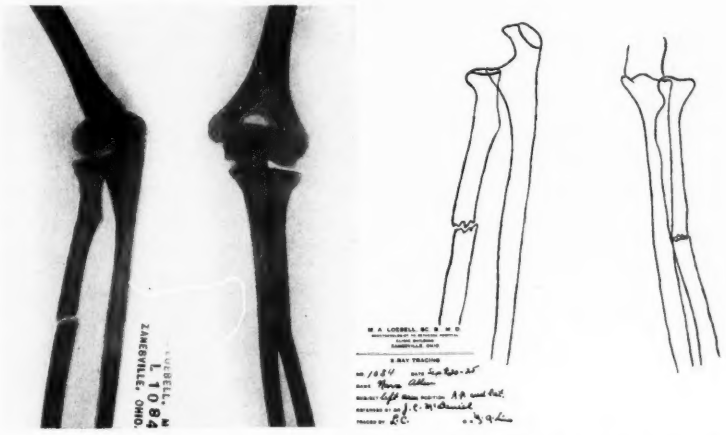

Fig. 1. Example of film of fracture and the tracing made from it.

At the hospital, tracings are initialed by the assistant, O. K.'d by the roentgenologist, and filed with the patients' hospital records. In our private practice a copy is sent to the physician or surgeon referring the case.

To laymen and others unaccustomed to reading radiographs, tracings present much clearer pictures than negatives. The speed, safety, accuracy, simplicity, and economy of this method are quite apparent.

EDITORIAL

M. J. Hubeny, M.D. . . . . *Editor*
Benjamin H. Orndoff, M.D. . *Associate Editor*

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PROGRESS

From Galileo and Copernicus to Darwin and Helmholtz may seem like a long interval; these pioneers in science have left their footprints on the sands of time, faintly but indelibly. However, in the past score of years the sciences have developed so furiously and extensively as to influence every human activity, creating new intellectual frontiers whose bounds seem limitless and urge towards new goals and achievements.

The basic sciences have firmly established themselves in medicine, displacing sophistries with sound reasoning. Instruments of precision such as the thermometer, stethoscope, electrocardiograph, microscope, and spectroscope are necessary adjuncts.

When Roentgen made his wonderful discovery, another boon to humanity was born. Its cyclonic development was astounding. To-day its field of usefulness is not limited to medical diagnosis and the treatment of disease, but the chemist, the physicist, the biologist, and the industrialist have combined. Another milestone was reached by the patient efforts of the Curies, paralleling the importance of the X-rays. To harness these agents is the task of the present-day scientist, thereby making this a happier world in which to live.

Men with a common purpose of high ideals and a sense of responsibilities united themselves and organized the Radiological Society of North America. From a stripling to a fair sized adult in a decade and a half is not a bad growth record; however, not content with past attainments, but vigorous and restless, it is searching for further expansion and fields of usefulness. The allegiance of its members and the vision of its officers have created a substantial organization—not a nebulous body gradually losing momentum, eventually becoming impotent, with final disappearance. Radiology, the official Journal, symbolized the virility of its members; a consistent expansion occurred, and it is with justifiable pride that we think of the steadfast support of the members making this possible.

The present period of tumultuous research and unity of purpose was sensed by certain analytical minds and it became quite evident that some means of co-ordinating and disseminating knowledge concerned with the investigation and application of radiant energy would become necessary. Up to the present no such outlet has existed, no means of making known immediately the natural steps in experimental progress and practical use.

It was at this point that the Chemical Foundation was approached by these analytical minds and the needs explained. After thorough investigation and consideration Radiology was selected as the means of spreading the gospel of radiant energy. Just one year ago the officers of the Radiological Society of North America accepted the wonderful opportunity of making Radiology even more important than heretofore. Like all vital projects, the foundations, working plans, and details require the

utmost thought, for, once embarked upon a program, no retrenchment is possible.

Attention is called to the July issue, especially to its size, its articles, its editorial by Dr. George L. Clark, and to the personnel of the Editorial Staff. The latter is international in scope and represents recognized authorities, covering all phases of investigation and application of radiant energy, assuring the readers of the most advanced and reliable data. Especial attention will be given in future issues to the cancer problem as it relates to radiology.

How was this development made possible? It is usual for scientific bodies to be limited financially, and, while this Society was on a sound financial basis, nevertheless expansion was possible only up to a given point. The generosity of the Chemical Foundation makes it possible to enlarge any issue in accordance with the amount of material on hand, without additional expense to the Society. It grants the essayists all the cuts necessary without charge. It gives each author 100 reprints gratis. It graciously creates a fund to remunerate abstractors whose efforts were heretofore wholly voluntary and whose sustained help is appreciated by the Editorial Department. It assures the Society that any deficit created by the editing and printing of the official Journal, RADIOLOGY, will be taken care of by the Chemical Foundation, which will reimburse the Society at the end of each quarterly period, at which time a statement will be issued to the Chemical Foundation by the Radiological Society of North America.

What does the Chemical Foundation get? *Nothing.*

It has nothing to do with the running of the Journal; it cannot control the editorial policy; it cannot control the financial policy. All it asks is the printing of acceptable articles relating to radiant energy, whether medical, physical, chemical, biophysical, or biochemical in nature, also industrial researches and their application.

What does the Chemical Foundation expect in return? For itself—*nothing.*

Should the Journal make a profit, the Chemical Foundation expressly states that this profit shall be expended for research in radiology under the direction of the Radiological Society of North America.

This co-operation and magnanimity are fruitful of great good. Will each reader of this article help in making RADIOLOGY a more potent factor in the radiological world? Will you contribute your mite, directly or indirectly? Will you stimulate the interests of our fellow-workers—the chemists, physicists, physiologists, biologists, and research workers—to help us? We extend to these and all others interested in the allied sciences an invitation to enter our fold of contributors. There is no line of cleavage—animate substances are derived from inanimate substances; the search for life and its phenomena still continues.

THE AMERICAN JOURNAL OF CANCER

The American Journal of Cancer, which will make its first appearance in January, 1931, will be not merely a continuation of the former *Journal of Cancer Research* but will represent a far wider field. It will continue to present the original papers on experimental work which established the earlier journal on such a sound scientific basis and will add to these, clinical contributions representative of the best opinion and practice both in America and abroad. Photographs, microphotographs, drawings, diagrams, and color plates will supplement the articles and add not alone to the beauty of the page but to the clarity and elucidation of the text.

One of the important new features of the Journal will be a complete abstract service covering the subject of cancer in all its phases and relationships, not only with the various branches of purely medical science—pathology, gynecology, dermatology, urology, neurology, surgery, etc., but also with chemistry, general biology, and genetics; the statistical, educational, and public health aspects will also be covered.

It is planned to make this abstract service a comprehensive survey of the world's literature so that within the pages of a single periodical the subscriber will have, issue by issue, the results of work being done not only in our own country but in Great Britain and the Continent, the clinics and schools of South America, Australia, South Africa, and the medical centers of China, Japan, and India. More than five hundred journals will be reviewed for this service as well as the reports of various Cancer Commissions and societies.

Editorial comment on the abstracted material will be offered as occasion arises and writers whose work is reviewed will be given an opportunity of replying to any criticism or questions that are raised in connection with their work, so that the Journal will be truly representative of all schools.

Clinical reports from the Memorial Hospital, book reviews, editorials, and various other features will be included.

The Journal will, of course, remain on the highest scientific basis, and, while its appeal will be wide enough to include the general practitioner as well as the most highly specialized research worker, no attempt will be made to "popularize" it in the commonly accepted sense of that term.

Dr. Francis Carter Wood, as Editor, has associated with himself an editorial staff whose names are at once a guarantee of the high standing of the Journal and of its wide scope. These include:

Surgery
Harvey Cushing
Robert B. Greenough
Dallas B. Phemister
Dean Lewis
Frank H. Lahey
Thomas M. Joyce
George David Stewart

Gynecology
Howard C. Taylor
Charles C. Norris

Urology
J. Bentley Squier

Dermatology
Martin T. Engman
William Allen Pusey
George Miller MacKee

Pathology
James Ewing
Aldred Scott Warthin
William Ophüls
H. E. Robertson

Surgical Pathology
Joseph C. Bloodgood

Experimental Pathology
William H. Woglom
Burton T. Simpson
Leo Loeb

Chemistry
H. Gideon Wells

General Biology
Edwin G. Conklin

Bacteriology
Hans Zinsser

Genetics
Thomas H. Morgan

Radiology
Maximilian J. Hubeny

Statistics
Edwin B. Wilson

Education
Clarence C. Little

Public Health
George H. Bigelow
Arthur M. Stimson

The American Journal of Cancer will continue to be published from the Institute of Cancer Research, Columbia University, quarterly at first, with the possibility of more frequent publication as the amount of material justifies. Its formation will be attractive and practical. Clear, readable type, good paper, well proportioned pages, and beautiful illustrations in color and black and white will make it a model of periodical manufacturing.

CANCER

"American Journal of Cancer"
"Radiology"

The universal scourge is receiving more attention now than ever; great efforts are being made to ameliorate or cure this pest. Researches are being made throughout the world; these investigations are clinical, therapeutical, biophysical, biochemical, and pathological in nature.

Do you wish to be abreast of the times? If so, a combined subscription to the *American Journal of Cancer* and RADIOLOGY to members of the Society can be had for $8.00; by non-members these two journals can be obtained for $9.00. Possession of these two will assure you of all facts and data as soon as they are available.

RATES TO THE ANNUAL MEETING

Because the all-year tourist rate to California prevails over all other rates, the Transcontinental Passenger Association has declined to make a rate of one and one-half fare for the round trip for the Los Angeles meeting. This notification reached me too late to be published in the November issue.

I. S. TROSTLER, M.D.

ROENTGENOLOGICAL CONFERENCE

BALTIMORE, FEB. 6 AND 7, 1931

The roentgenologists of Baltimore issue a cordial invitation to other roentgenologists to attend a conference in their city on February 6 and 7, 1931. The Lord Baltimore Hotel will be the headquarters of the meeting, and it is hoped that all those attending will stay at this hotel because bus transportation will be furnished to and from the different meeting places.

It is contemplated having the opening session at the Johns Hopkins Hospital, Friday morning at 9 o'clock, and the afternoon session at the University of Maryland Hospital. Some entertainment will be provided for Friday night. Saturday the scientific session will be held at the Mercy Hospital. The Staff of the Howard A. Kelly Hospital will conduct a conference on roentgen and radium therapy.

It has been a long time since the Baltimore roentgenologists have held a conference and they hope many will find it possible to attend.

CHARLES A. WATERS, M.D., *Chairman,*
1100 North Charles Street,
HENRY J. WALTON, M.D., *Secretary,*
104 West Madison Street,
JOHN W. PIERSON, *Treasurer,*
1107 St. Paul Street.

DR. J. C. BLOODGOOD'S CLINICS AT THE LOS ANGELES MEETING

Pursuant to Dr. Bloodgood's "Invitation to Radiologists," in the September issue of RADIOLOGY (page 403), two clinics will be held by Dr. Bloodgood, to which each physician attending the Los Angeles meeting may bring a lantern slide of a bone tumor case for interpretation. Wide announcement of these clinics has already been made, the present brief notice serving simply as a final reminder.

Dr. Bloodgood's clinics are always largely attended, and have proved of inestimable value to those who, through the medium of slides or films, have availed themselves of his advice.

CORRECTIONS

Attention is called to a correction in Dr. Webster W. Belden's discussion of the paper on Verruca Plantaris by Dr. J. Newton Sisk in the November issue (p. 565).

Beginning at the fifteenth line, it should read as follows: "We use the following technic: Shielding down carefully around the lesion with lead, we apply a 6-inch gap, 3 ma. of current, 2 min. exposure time, at an 8-inch distance."

Dr. George E. Pfahler wishes to state that, referring to his paper in the September issue, Figures 11 (page 348) and 13 (page 350) are transposed, the descriptive legend now accompanying Figure 11 rightfully referring to Figure 13 and the legend as printed with Figure 13 to be read as belonging with Figure 11.

A NEW DEPARTMENT OF RADIOLOGY

The September, 1930, issue of *Clinical Medicine and Surgery* marks the initiation of a new Department of Radiology, of which the Associate Editors are Henry Schmitz, M.D., F.A.C.S., F.A.C.R., and Wilbur H. Gilmore, M.D., both of Chicago

and both members of the Radiological Society of North America. The latter contributes a paper entitled "The Roentgenologist," in which he makes the following well-considered comments:

"A discussion of the position of the roentgenologist, in this advanced age of diagnostic medicine, would be trite, but the many laymen who have entered the technical side of roentgenology, who maintain so-called commercial X-ray laboratories, and who presume to advise medical men as to the proper interpretation of X-ray shadows, is so great that I feel it will not be amiss to attempt to differentiate between a graduate physician, skilled in the use of the X-rays, and a mere film-maker or technician.

. . . . . .

"Probably the source of most trouble in X-ray interpretation is the inherent tendency in all of us *to see entirely too much.* One may have years of experience, but this fact must always be kept in mind, or we shall be guilty of what may sometimes be a very serious error. True, the more years one spends in studying the X-ray shadows, the less likely one is to make this mistake, but the danger is always very real.

"When we consider the intricate structure of the human body and the many variations which may be present, all within normal limits, and the many pathologic changes which may occur, and then try to separate all the shadows on the film, due to both normal and abnormal conditions of structures, is there any question that the man rendering the service should be medically trained?

"There has been no attempt to present here a scientific treatise, but I have tried to give the viewpoint of the physician who is trying to specialize in the honest use of the X-rays. It has been possible only to generalize, in this discussion, but if the points which have been raised are true, how can the non-medical individual render the service which the attending physician should receive and must have, if the man who pays the bill is to get what is due him?"

Dr. Schmitz contributes "An Outlook in Cancer Therapy," a brief paper, yet one full of concrete statements, among others, the following:

"These facts have been recognized by the American Society for the Control of Cancer and the American College of Surgeons. The societies are of the opinion that the treatment of cancer must be entrusted to those physicians who are equally well trained in the surgical technic of radical cancer eradication and in the application of radiation, either by seeds intratumorally, or by surface and distant radiation. Only thus can the cancer patient receive the benefits of either method of treatment, alone or in combination, according to standardized indications based on the location and extent and the histologic character of the growth."

ESSAYISTS ON THE PROGRAM OF THE ANNUAL MEETING

The following is an alphabetical list of the essayists on the program of the Annual Meeting, Los Angeles, Dec. 1 to 5, 1930.

1. Kenneth D. A. Allen, M.D., Denver
   "The Post-operative Behavior of the Diaphragm."
2. Emil G. Beck, M.D., Berkeley, California
   "Co-operation between Surgeon and Radiologist Essential to Effective Cancer Therapy."
3. David S. Beilin, M.D., Chicago
   "The Clinical Value of Oral Cholecystography."
4. Webster W. Belden, M.D., New York City
   "Further Observation of Osteitis Deformans."
5. Edward S. Blaine, M.D., Chicago
   "Another Case of Needle with Encrusted Stone in the Kidney."

6. Joseph C. Bloodgood, M.D., Baltimore
"Relative Merits of the Irregular Practitioner, Particularly in Relation to Cancer."
7. Arthur R. Bloom, M.D., and
W. L. Hull, M.D., Detroit
"Intravenous Pyelography in the Normal."
8. William R. Brooksher, Jr., M.D., Fort Smith, Arkansas
"Linitis Plastica."
10.[1] Samuel Brown, M.D., Cincinnati
Title to be announced later.
11. Thomas A. Burcham, M.D., Des Moines, Iowa
"Industrial Spines."
12. Montrose T. Burrows, M.D., Pasadena, California
"Clinical and Experimental Observations Relative to the Etiology of Cancer."
13. John D. Camp, M.D., Rochester, Minnesota
"A Roentgenologic Study of Pyloric and Pre-pyloric Deformities."
14. John R. Carty, M.D., New York City
"An X-ray Sign in the Diagnosis of Esophageal Orifice Hernia."
15. Henry A. Chapin, M.D., Jacksonville, Illinois
Title to be announced later.
16. George L. Clark, Ph.D., Urbana, Illinois
Titles of papers to be announced later.
17. L. G. Crosby, M.D., Denver
Title to be announced later.
18. Kenneth S. Davis, M.D., Los Angeles
"Atypical Bone Tumors, with a Presentation of Two Cases."
19. Jesse W. M. Du Mond, Ph.D., and Archer Hoyt, Ph.D., Pasadena, California
"Present Status of the Problem of Measurement of X-ray Intensity and Quality."
20. John Dunlop, M.D., and
Carl H. Parker, M.D., Pasadena, California
"The Treatment of Compressed and Impacted Fractures of the Bodies of the Vertebræ."
21. Maurice F. Dwyer, M.D., Seattle, Washington
"Gastric Tumors."
22. Leo Eloesser, M.D., San Francisco
"Congenital Cystic Disease of the Lung."
23. Edwin C. Ernst, M.D., St. Louis
Title to be announced later.
24. Frances A. Ford, M.D., Rochester, Minnesota
"Radiation Therapy in Functional Ovarian Disorders."
25. Leo H. Garland, M.D., San Francisco
N. E. Wayson, M.D., Honolulu, Hawaiian Islands, and
W. Edward Chamberlain, M.D., San Francisco
"The Bone and Joint Changes of Leprosy."
26. Roy G. Giles, M.D., Temple, Texas
"Radiotherapy in Myelogenous Leukemia."
27. Mark A. Glaser, M.D., Los Angeles
"Campiodol."
28. Otto Glasser, Ph.D., and
U. V. Portmann, M.D., Cleveland
"Gurwitch's Mitogenetic Radiation."
29. Thomas L. Gray, M.D., St. Thomas, Ont., Canada
"The Value of X-rays in Diagnosis."
30. Thomas A. Groover, M.D.,
Arthur C. Christie, M.D., and
E. A. Merritt, M.D., Washington, D. C.
"The Radiologist as a Consultant."
31. Joseph L. Harvey, M.D., Denver
"The Training of the X-ray Technician."

[1] R. Mark Brown, M.D., of Ogden, Utah, who was to have presented a paper, passed away Sept. 12, 1930.

32. CHARLES H. HEACOCK, M.D., Memphis, Tennessee
"Obstructive Lesions of the Small Bowel."
33. I. SETH HIRSCH, M.D., New York City
Title to be announced later.
34. FRED JENNER HODGES, M.D., Madison, Wisconsin
"Lipiodol Studies of the Female Pelvic Organs."
35. C. C. HOPKIRK, M.D., Santa Monica, California
"Observations in the Practice of Roentgenology in the Japanese Empire."
36. HARVEY S. HUNSBERGER, M.D., San Francisco
"Adaptation of Technics to Individual Cases: Some Special Views that have Proven Valuable."
37. LEOPOLD JACHES, M.D., New York City
Title to be announced later.
38. MINAS JOANNIDES, M.D., Chicago
"The Influence of the Diaphragm on Gastric Peristalsis."
39. MAX KAHN, M.D., Baltimore
Title to be announced later.
40. MAURICE I. KAPLAN, M.D., Chicago
"Observations in Skull Injuries."
41. L. C. KINNEY, M.D., San Diego, California
"Bone Changes in Buerger's Disease and Arteriosclerosis."
42. CARL E. KOENIG, M.D., Seattle, Washington
"Pulmonary Tuberculosis in Children."
43. ERNEST A. KRAFT, M.D., Danville, Illinois
"Atypical Pleural Effusion."
44. JOHN D. LAWSON, M.D., Woodland, California
"Further Observations in the Use of High Milliamperage Technic."
45. ISAAC LEVIN, M.D., New York City
"Proper Co-ordination between Surgery, Radium, and X-ray Therapy in Cancer of the Breast."
46. BURTON J. LEE, M.D., New York City
Title to be announced later.
47. LESTER LEVYN, M.D., Buffalo, New York
"Cholecystography in the Late Months of Pregnancy."
48. JAMES L. MCKNIGHT, M.D., Tucson, Arizona
"Tuberculosis of the Bowel, with Special Reference to X-ray Diagnosis."
49. H. E. MARTIN, M.D., and
OTTO H. PFLUEGER, M.D., San Francisco
"Comparative Radiosensitivity of Epidermoid Carcinoma within Hypopharynx."
50. JAMES M. MARTIN, M.D., Dallas, Texas
"Radiation Therapy of Malignant Lesions of the Mouth."
51. LEON J. MENVILLE, M.D., New Orleans
"X-ray Study of the Passage of Various Foodstuffs through the Gastrointestinal Tract of Man."
52. LEON J. MENVILLE, M.D., New Orleans
"The Lay Situation in Louisiana."
53. LOUIS A. MILKMAN, M.D., Scranton, Pennsylvania
"Pseudofractures—Multiple, Idiopathic, Progressive, and Symmetrical."
54. E. H. NEWCOMER, M.D.
N. B. NEWCOMER, M.D., and
C. A. CONYERS, M.D., Denver
Title to be announced later.
55. FREDERICK W. O'BRIEN, M.D., Boston
"Unrecognized Vertebral Fracture *versus* Kummell's Disease."
56. BENJAMIN H. ORNDOFF, M.D., Chicago
"The Pathological Cervix: A Pre-cancerous Lesion."

57. C. C. Owen, M.D., San Bernardino, California
Title to be announced later.
58. Henry K. Pancoast, M.D., and Eugene P. Pendergrass, M.D., Philadelphia
Title to be announced later.
59. Roy A. Payne, M.D., Portland, Oregon
"The Present Status of Appendiceal Diagnosis."
60. C. E. Piersall, M.D., Reno, Nevada
"Hypodermoliths."
61. Ernst A. Pohle, M.D., Ph.D., Gorton Ritchie, M.D., and Cecil S. Wright, M.D., Madison, Wisconsin
"The Effect of Roentgen Rays on the Healing of Wounds."
62. Sidney A. Portis, M.D., Chicago
Title to be announced later.
63. R. P. Potter, M.D., Marshfield, Wisconsin
Title to be announced later.
64. D. T. Quigley, M.D., Omaha, Nebraska
"What shall we Teach the Public in Connection with Cancer and how shall we Present it?"
65. D. A. Rhinehart, M.D., Little Rock, Arkansas
"Air and Gas in the Tissues: A Radiological Study."
66. Charles M. Richards, M.D., San Jose, California
Title to be announced later.
67. Cassie B. Rose, M.D., Chicago
"X-ray Treatment of Bone Metastasis."
68. George S. Sharp, M.D., New York City
"Treatment of Maxillary Antrum Growths, with Special Reference to the Procedures Both Radiological and Surgical Depending upon the Degree of Advancement of the Growth."
69. William A. Shaw, M.D., Elko, Nevada
"Difficulties Confronting the Small Town X-ray Man."
70. Benjamin H. Sherman, M.D., Hollywood, California
"Pre- and Post-operative Treatment of Scar Tissue."
71. A. B. Smith, M.D., San Diego, California
"General Subject of 'Fed Meal' or Opaque Enema."
72. Robert S. Stone, M.D., San Francisco
"X-ray Findings in the Chests of Tuberculin-positive Children."
73. Henry Snure, M.D., Los Angeles
"Mediastinal Pleurisy."
74. Albert Soiland, M.D., Los Angeles
"An Adjunct in the Care and Treatment of Cancer."
75. J. V. Sparks, M.D., London, England
"Pulmonary Asbestosis."
76. Harold A. Spilman, M.D., and E. T. Edgerly, M.D., Ottumwa, Iowa
"Pulmonary Tuberculosis."
77. Lorenzo L. Stephens, M.D., Seattle, Washington
"Epitheliomata of the Face and Head." (Illustrated by moving picture.)
78. Laurence R. Taussig, M.D., San Francisco
"A Lantern Slide Demonstration of Malignant Growths of the Skin and Their Treatment by Radium."
79. Henry J. Ullmann, M.D., Santa Barbara, California
Title to be announced later.
80. Harry M. Weber, M.D., Rochester, Minnesota
"Roentgenologic Manifestations of Tuberculosis in the Alimentary Tract."
81. William O. Weiskotten, M.D., San Diego, California
"Roentgen Diagnosis of Obstetrical Monsters."
82. Sanford Withers, M.D., Denver

"Admission of X-ray Plates as Court Evidence."

83. Francis Carter Wood, M.D., New York City
"Palliative Radiotherapy of Malignant Growths."

84. George A. Wyeth, M.D., New York City
"The Evolution and Present Status of Electrosurgery in the Treatment of Cancer."

85. Mme. N. Dobrovolskaia Zavadskaia
"What is an Elective Action of the Penetrating Rays on the Living Cell?"

Joseph Bloodgood, M.D., Baltimore
Bone Clinic.

Leopold Jaches, M.D., New York City
Clinic.

Ernst A. Pohle, M.D., Ph.D., Madison, Wisconsin

W. S. Peck, M.D., Ann Arbor, Michigan

W. Stenstrom, Ph.D., Minneapolis

John S. Coulter, M.D., Chicago, Illinois
Symposium on Physical Therapy

Douglas Quick, M.D., New York City
Leader of Cancer Symposium.

Rollin H. Stevens, M.D., Detroit, Michigan
Leader of Skin Symposium.

SEVENTH ANNUAL MEETING OF THE BOARD OF CHANCELLORS OF THE AMERICAN COLLEGE OF RADIOLOGY, HOTEL STATLER, DETROIT, MICH., JUNE 24, 1930

EXCERPTS FROM THE MINUTES

Election of Officers. — President-elect Stevens called for nomination of officers. Secretary Soiland nominated Fellow A. C. Christie for President-elect, and upon motion duly seconded and passed, the Secretary was instructed to cast the unanimous vote of the Chancellors for Dr. Christie.

Chancellor Pfahler placed in nomination for Vice-president Fellow Lyell C. Kinney, of San Diego. Upon motion seconded and passed, the Secretary was instructed to cast a unanimous ballot for Dr. Kinney.

Chancellor Pancoast then placed the name of Treasurer Orndoff in nomination to succeed himself, and he was duly re-elected.

The same procedure followed the nomination of Historian Trostler by Chancellor Wasson, and the Secretary cast the ballot for Historian Trostler.

The following candidates, Dr. Eugene P. Pendergrass, Dr. William E. Costolow, Dr. Frederick W. O'Brien, Dr. Louis J. Carter, and Dr. C. E. Piersall, were created Fellows of the College by the Board of Chancellors.

President Case announced the selection of six distinguished foreign radiologists for the degree of Honorary Fellowship. These are: James Heyman, of Stockholm; Ellis G. E. Berven, of Stockholm; Stanley Melville, of London; Manuel F. Madrazo, of Mexico City; J. A. Saralegui, of Buenos Aires; Pedro Barcia, of Montevideo.

BOOK REVIEWS

Lehrbuch der Strahlentherapie (Text-book on Radiation Therapy). Edited by C. J. Gauss, Würzburg. Volume IV, in two parts. Pp. 1393, with 415 illustrations in the text and 17 color plates. Published by Urban & Schwarzenberg, Berlin, Vienna, 1929. Price, 98 Marks ($23.43).

Under the direction of Hans Meyer, Editor of *Strahlentherapie*, a text-book on radiation therapy is being published in five volumes, the fourth of which, dealing with gynecological diseases, has appeared recently. It is intended to acquaint the general practitioner with modern radiation therapy in gynecology, to help the gynecologist in his work, to familiarize the radiologist with

the proper indications for radiation in this field, and to convince those gynecologists still showing a skeptical attitude toward radiation of its merits.

The first three chapters deal with the theoretical fundamentals of gynecological therapy; they discuss "Biological Principles of Gynecological Radiation Therapy" (Walther Schmitt, Würzburg); "The Physical and Technical Foundations of Roentgen Therapy" (Hermann Wintz and Walther Rump, Erlangen); "The Physical and Technical Foundations of Gynecological Radium Therapy" (Th. C. Neeff, Würzburg). Then follow the clinical contributions under the following headings: "The Roentgen Treatment of Uterine Fibroid and Hemorrhagic Metropathy" (C. J. Gauss, Würzburg); "The Treatment of Non-malignant Gynecological Diseases by Radio-active Substances" (H. Kupferberg, Mainz); "The Radiation Treatment of Tuberculosis of the Female Genital Organs" (Heinrich Eymer, Innsbruck); "Rare Indications for Gynecologic Roentgen Treatment" (Emil Vogt, Tübingen); "Roentgen Therapy of Malignant Tumors of the Genital Organs" (Ludwig Seitz, Frankfurt-am-Main); "The Radium Treatment of Malignant Neoplasms in Gynecology" (Ernst Ritter v. Seuffert, München); "The Post-operative Roentgen Therapy and General Treatment of Gynecological Carcinoma" (K. Warnekros, Dresden); "The Roentgen Treatment of Mammary Carcinoma" (Hermann Wintz, Erlangen); "The Roentgen Treatment of Carcinoma of the Breast" (Hans Holfelder, Frankfurt-am-Main); "Dangers and Injuries in Gynecological Deep Therapy" (Wilhelm Flaskamp, Erlangen); "Light Therapy in Gynecology" (Heinrich Guthmann, Frankfurt-am-Main); "The Rôle of Diathermy in Gynecology" (W. Lindemann, Halle a.S).

A scrutiny of the names of the contributors leads one to expect a source of valuable information in this book and the reader is certainly not disappointed. The addition of the last two chapters on "The Use of Light and Diathermy in Gynecology" adds to the completeness of the presentation of the subject. Most articles are well illustrated and accompanied by extensive bibliographies. C. J. Gauss (Würzburg), one of the pioneers in gynecological radiation therapy, who edited this fourth volume, can well be proud of the results of his efforts.

E. A. P.

PROSTHETIC DENTISTRY: An Encyclopedia of Full and Partial Denture Prosthesis. By IRA GOODSELL NICHOLS, D.D.S., Lieut. Comm. D.C.–V.(S.), U.S.N.R., Special Lecturer and Instructor in Dental Prosthesis, Dental Dept., U. S. Naval Medical School, Washington, D. C., with the collaboration of forty-five authorities. Pages 687, illustrations, 830, color plates, 3. Price $12.50. Published by C. V. Mosby Company, St. Louis, U. S. A., 1930.

Dr. Nichols has given the profession something different in his recent volume, "Prosthetic Dentistry." It is truly an encyclopedia covering the subject most thoroughly. Some of the best men in the dental profession have collaborated with him. In addition to dealing with prosthetic dentistry, he has dealt with the surgical phase; the injured patient; as well as with the surgical preparation of dentures.

The chapter on "A Consideration of Bacterial Growths on Artificial Dentures as the Cause of Chronic Denture Palatitis," by W. J. Pryor, is particularly interesting since nearly every dentist has had more or less trouble with inflammatory conditions caused by artificial teeth and has been at a loss to account for these unsatisfactory results.

Dr. Howard H. Jackson's article, "Intra-oral Radiography in Denture Prosthesis," is of extreme importance and will surely be

well received by its readers. He lays stress on knife-edge ridges, and residual areas of infection, each of which are many times overlooked. This chapter will add materially to the knowledge of any dentist who is interested in denture work.

Arthur E. Smith has covered block anesthesia in his usual competent manner. The photographic work is excellent and the illustrations in general make the chapter easy to read.

Dr. Menifee R. Howard's report of "An Unusual Case of Alveolotomy" shows what can be accomplished from the surgical aspect of a most difficult case.

Dr. George M. Dorrance has treated his subject, "Torus Palatinus," in a most satisfactory way. It deals with the anatomic variations as well as the technic of a most successful operation.

V. H. Kazanjian has taken up the subject of "Prosthetic Restoration of Deformities of Face and Jaw" in a manner which will be found unusually interesting and instructive to any dentist who deals with this phase of oral surgery.

"The Treatment of Edentulous Jaw Fractures," by J. Orton Goodsell, Jr., adds materially to the book and as a reference work will be of much value to any dentist's library.

"Cast Gold Full Dentures and Immediate Gold Dentures," by Sidney S. Jaffe; "Stress-breaking Partial Denture and Removable Bridge Construction," by L. M. Farnum; "The Tube Attachment," by Henry P. Boos; "Akers' Technic," by Polk E. Akers, himself; "Gum Blocks for Partial Dentures," by Walter M. Bartlett, and "Continuous Gum Partial Dentures and Removable Bridges," by James L. Howard, are all valuable chapters, each author dealing with his subject in a most intelligent manner. There are other contributors whose articles are of equal interest.

Dr. George M. Hollenback's chapter on "The Preparation of Vital Teeth as Bridge Abutments and the Construction of Attachments" is well illustrated and easy to be understood.

All in all, the book is a splendid one, and undoubtedly will be well received by the profession.

ABSTRACTS OF CURRENT LITERATURE

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EXPERIMENTAL STUDIES

The Effect on Serum Calcium of Roentgen Irradiation of the Splenic Area. Enrico Benassi. Rivista di Radiologia e Fisica Medica, May, 1930, II, 311.

The author irradiated the splenic region of two groups of five rabbits each with strong and light doses of X-rays to determine the effect on the level of calcium in the blood serum. Light doses produced no demonstrable effect. Strong doses, on the contrary, produced a marked and lasting effect by depletion of the calcium reserve of the body. In this the author finds an explanation of the biologic effect of X-rays as an alteration in the function of the spleen, and, from this, a change in the endocrine balance of the body.

E. T. LEDDY, M.D.

Studies on the Natural Immunity of Chickens to Anthrax Following Roentgenization. Giovanni Balestra. Rivista di Radiologia e Fisica Medica, January, 1930, II, 60.

One group of chickens was given general irradiation, with sublethal doses, and inoculations were made at varying intervals afterwards. In the second group, localized areas were treated with erythema doses and these areas were inoculated. In no case could the anthrax bacillus be found in the blood stream of these chickens. The author concludes that X-rays do not alter the immunity of chickens to anthrax.

E. T. LEDDY, M.D.

Protection Afforded by Short Infra-red and Red Rays to a Lethal Dose of Staphylococcus. Leonard Hill and Albert Eidinow. Brit. Med. Jour., March, 1930, No. 3,608, p. 388.

The rays from a "Beam" radiant fuel gas fire were used. Rabbits used in the experiment were about two kilograms in weight, shaved on both sides, and exposed in a wire cage to the cross-fire of two gas fires. A fan was kept running to keep the body temperature from rising more than two or three degrees Fahrenheit.

The dose of staphylococcus culture injected in each rabbit was 0.6 c.c.; this dose proved lethal to all the non-irradiated control animals in the average time of 1.2 days. Protection was afforded by "Beam" gas-fire radiation, but dark heat radiation of unshaved rabbits did not appear to have any protective power. It was concluded that the short infra-red rays and red rays had the power—by acting on the skin—of increasing resistance to a general staphylococcal infection.

WALLACE D. MACKENZIE, M.D.

The X-ray Absorption Spectrum of the Chorio-allantoic Membrane of Chick Embryo and the Emission Spectrum of the Ash of the Egg of the Domestic Fowl: A Preliminary Communication. William H. Love. Med. Jour. Australia, Sept. 21, 1929, II, No. 12, p. 395.

This paper deals with a field of X-ray research which has been developed following upon the observation of Dr. Moppett that certain narrowly defined wave length bands, notably, 0.8 and 0.5 Ångström unit, exert selective damage upon the chorio-allantoic membrane of the chick. The fact that these two wave lengths correspond to the L absorption edges of lead and uranium, respectively, gave rise to the suggestion that the mechanism of this selective effect arose from the presence of these metals in the tissue. Chemical evidence of the presence of these elements having already been given, the author now investigates the X-ray absorption spectrum of the chorio-allantoic membrane with a Müller spectrometer. Two absorption lines were found, one corresponding to the L_2 discontinuity of uranium and another with the L_2 discontinuity of lead.

The fact that a line absorption was found and not the more usual absorption band and edge is highly interesting. This phenomenon has been noticed before by Lindh in connection with the K absorption of sulphur in gypsum, which showed line and not band

absorption. The author makes the suggestion that when the absorbing element is in a highly dispersed form the absorption phenomena are modified. That is to say, the ratio of the number of absorbing atoms to the number of quanta of X-ray energy which impinge upon them influences the absorption process. The ordinary laws for the absorption of X-rays have been developed experimentally upon thick slices of materials where there are many more absorbing atoms than there are quanta to be absorbed. Where the situation is reversed, and there are many more quanta presented to the material than there are atoms to absorb them, the absorption process may undergo modification. An atom occupied in absorbing one quantum may not be able simultaneously to absorb another.

These suggestions are highly significant in connection with the practice of radiotherapy, where we may suppose the human body, like the chick membrane, to contain heavy atoms in such low concentration that different absorption phenomena may manifest themselves.

The work needs to be confirmed.

J. G. Stephens, M.D.

Studies on Roentgen Sensitization. III.—The Sensitizing Effect of Thorium Nitrate. S. A. Nikitin. Strahlentherapie, 1930, XXXVI, 745.

White mice, rats, and guinea pigs received subcutaneous and intracutaneous injections of a 10 per cent thorium nitrate solution in water. Some animals were also exposed to roentgen rays either before or after injection. Technic: 230 K.V., cardboard filter, 0.5 mm. Al, 1.0 mm. Al or 0.5 mm. Cu + 1.0 mm. Al, 370 to 640 r. It appeared that the effect of a combined application of roentgen rays and thorium nitrate was not dependent upon a secondary electronic emission from thorium. Roentgen irradiation of injected animals did not show any qualitative changes as compared with the effect of the injection alone. The toxic action of the thorium nitrate was increased by irradiation because its resorption was hindered.

Ernst A. Pohle, M.D., Ph.D.

GALL BLADDER (NORMAL AND PATHOLOGICAL)

Symptomatical Importance of Deformed Gall-bladder Shadows. Fritz Eisler. Wien. Klin. Wchnschr., July 24, 1930, XLIII, 945.

One may distinguish between true and false deformities of the gall-bladder shadow, as demonstrated by the dye method. True deformities are caused by organic changes in the gall-bladder wall or by processes in the surrounding organs. Kinks in the outline of the gall bladder are seen fairly often. It cannot be stated definitely whether or not this anomaly may lead to symptoms. Congenital malformation of the gall bladder has been seen occasionally, also gall-bladder deformities caused by variations in the hepatoduodenal ligament. The demonstration of adhesions is only rarely possible; an hour-glass gall bladder was found to be caused by adhesions in some cases. The pseudodeformities are caused by the projection or by displacement and pressure from neighboring organs (stomach, intestines, kidney). The pseudodeformities of the gall bladder appear to be more frequent than the true organic deformities.

H. W. Hefke, M.D.

Simultaneous Biliary Drainage and Cholecystography for Confirmation of the Meltzer-Lyon Test. Pedro L. Fariñas and Fernando Milanés. Arch. de la Sociedad de Estudios Clinicos de la Habana, May, 1929, XXIX, 245.

The authors discuss at length the confirmation of the Meltzer-Lyon test by means of cholecystography, using biliary drainage after gall-bladder iodization, with the idea of establishing the advantages, if any, of doing cholecystography and biliary drainage simultaneously. They base their conclusions on the results obtained in thirty-one cases of normal and pathological gall bladders, verifying the

reduction in size and disappearance of the gall-bladder shadow when stimulated. They obtained amounts of bile "B" (Lyon) in proportion to the reduction in size of the gall-bladder shadow. The opposite was also demonstrated, *i.e.*, that there was no reduction in size of the gall bladder where no bile "B" was obtained.

The authors do not see any advantage in making both the Meltzer-Lyon and Graham tests.

M. VIAMONTE, M.D.

Cholecystography. C. J. Johannesson. Northwest Med., June, 1930, XXIX, 256.

Cholecystitis is one of the most common causes of abdominal symptoms; therefore the development of gastro-intestinal studies in combination with cholecystography is important. One should use the technic with which he is most familiar and work in close co-operation with physician and surgeon. This author uses the oral method because of its convenience. Twelve hours after the dye is taken, films are made in inspiration and expiration; then the barium meal is given for study of stomach and duodenum. Four hours later the sixteen-hour films of the gall bladder are made; then a fatty meal is given and films made two hours later, to study the effect of fat on the gall-bladder function. The classification suggested by Case is used and recommended as a means of correlating the results of various workers.

W. W. WATKINS, M.D.

Gall-bladder Disease: A Consideration from a Diagnostic Viewpoint. Virgil E. Simpson. Jour. Indiana St. Med. Assn., July, 1930, XXIII, 305.

Cholecystography is now a well recognized and universally used method of gall-bladder study. In correlating the symptoms with the X-ray evidence of disturbed function, one must ask how much disturbance there can be that yet produces no symptoms, or whether there can be enough disturbance of function to produce symptoms without a corresponding degree of pathology. The author agrees with Graham that this latter condition can exist. Cholecystography is more than a mere functional test of the gall bladder; it is the nearest approach to actual knowledge of the anatomic condition that is afforded by any means aside from visual inspection after operation. There should be a uniform technic, whether oral or intravenous methods are used. In the intravenous method, the author's technic is to give the dye at 8 A. M., withholding breakfast, with films at four hours and again at six hours; then a fatty meal with films one hour later and as many subsequent times as the case demands. In oral administration, following a supper free from fats, four grams of dye are given at 8 P. M., with films at 9 A. M. the following morning, withholding breakfast; then a fatty meal and films one hour later and thereafter as warranted. Graham's definite claim that absence of shadow after intravenous dye is positive proof of gall-bladder disease is questioned, Hines apparently having proven that in cases of achylia the gall bladder may not outline. The simultaneous study of liver function and gall bladder with dye, as suggested by Cole and his associates, has not proven entirely satisfactory as yet, though the principle is good.

W. W. WATKINS, M.D.

Is Cholecystography an Examining Method for the General Practitioner? Ferdinand Lebermann. Deutsche med. Wchnschr., June 27, 1930, LVI, 1087.

The author discusses in detail the value of cholecystography for the physician in general practice, and comes to the following conclusions: During the last five years, cholecystography has been developed into a very valuable diagnostic method. It gives information as to the patency of the ducts, the condition of the gall-bladder wall and its surroundings, and usually permits the exclusion of gall-bladder disease in doubtful cases. The technic is simple and not dangerous when using the oral method. The intravenous application is unsuitable for the general practitioner, and rec-

tal or duodenal applications are not essential. The oral method can be used by every physician in the residence of the patient, and does not bother the patient to any extent. The expense for the examination must be called reasonable. There is no doubt, then, that cholecystography belongs to the diagnostic methods of the general practitioner.

ERNST A. POHLE, M.D., PH.D.

Diagnosis of Galltract Disease. William A. Swalm. Northwest Med., June, 1930, XXIX, 247.

The gall bladder is only a unit in a complex system, which must be borne in mind in interpreting symptoms and laboratory findings. In cholecystography two factors must be borne in mind: if the gall bladder fills, concentrates, and empties, it is believed to be normal, regardless of the method by which dye is given. Cholecystographic study cannot differentiate between cystic duct obstruction due to catarrh and that produced by adhesions, stone block, or stricture. The shadow is dependent upon the weight of the patient, thickness of the abdominal wall, and a consideration of the density of other structures in contrast with the gall bladder.

W. W. WATKINS, M.D.

The Diseased Gall Bladder. B. B. Davis. Nebraska St. Med. Jour., June, 1930, XV, 220.

The diagnosis of gall-bladder disease is often exceedingly simple and yet sometimes it challenges the resources of the most experienced. The three important steps necessary to arrive at a diagnosis and their relative importance are: (1) a careful history (70 per cent); (2) a painstaking physical examination (20 per cent); (3) various laboratory tests (10 per cent). When all possible information has been obtained from the history and physical examination, and not until then, is it time for laboratory tests. The laboratory procedure which seems to have the greatest value at present is the Graham-Cole test, the chief value of which is not to point out pathology, but to show gall-bladder function.

This author does not think it important whether the dye is given intravenously or orally. When it has been correctly applied and the results intelligently interpreted, how fully can it be relied upon? He quotes Graham to the effect that the positive findings were shown at operation to be correct in 97.8 per cent of 446 cases. In negative results, of 115 cases, only 74 per cent were found at operation to be free from pathology. Therefore, when the clinical picture of gall-bladder disease is confirmed by the dye test one can confidently recommend operation; on the other hand, if the clinical diagnosis is positive, one can proceed with operation even in the face of a negative Graham test.

W. W. WATKINS, M.D.

Physiology and Surgery of the Biliary Tract. R. R. Kahle. Ohio St. Med. Jour., July, 1930, XXVI, 602.

Cholecystography has been an invaluable aid in the diagnosis of gall-bladder disease. A careful history and physical examination, supplemented by cholecystography, usually suffice to make a correct diagnosis. The gall-bladder wall has been shown by the work of Judd and Mann to be particularly vulnerable to both chemical and bacteriological invasion. The present-day treatment of cholecystitis and cholelithiasis, in the presence of well-defined symptoms, is essentially surgical. The ideal treatment to be sought in the future must be prophylactic, to prevent infection and biochemical imbalance of the biliary tract.

W. W. WATKINS, M.D.

GASTRO-INTESTINAL TRACT (DIAGNOSIS)

Intramural Inflammation of the Colon Simulating Cancer. Whitfield Crane. Jour. Am. Med. Assn., July 26, 1930, XCV, 261.

In inflammatory tumors of the intestinal tract the majority are found in the colon. While these lesions may apparently be found in any segment of the large bowel, the ileocecal region seems to be the one commonly af-

fected. The pathologic changes are fairly uniform. A definite thickening of the bowel wall obtains, which forms a distinct tumor involving most of the coats. These lesions must not be confused etiologically with those commonly seen arising on a basis of diverticulitis.

Local infection is favored over metastatic in etiology. Various observers have classified them differently. From a practical standpoint there is an intramural chronic inflammatory condition of the bowel wall, the gross picture simulating in every particular either cancer or infectious granuloma.

One case is reported in which complete function was restored after a two-stage operation.

CHARLES G. SUTHERLAND, M.D.

Acute Intestinal Obstruction—Its Diagnosis by the Flat X-ray Film. Marcus H. Rabwin and Ray A. Carter. California and Western Med., July, 1930, XXXIII, 483.

The authors have been impressed by the fact that acute intestinal obstruction is one of the most common emergencies found at the Los Angeles County General Hospital, and that the prognosis is better in those patients having an early diagnosis than in the late cases. They use a flat film in this diagnostic work. The patient is given a "1-2-3" or milk and molasses enema in order to clear the bowel of gas below the obstruction, if one exists. The exposure is made in the same manner as a kidney film, and is seen by the roentgenologist and the surgeon as soon as it is developed.

The radiographic evidence of obstruction is based upon gas-filled, distended intestines, the distinction between colonic and small bowel obstruction depending upon the identification of distended gut as colon or small bowel. Normally there may be very little or a great deal of gas in the colon and a small amount scattered in the small intestines. The thing they look for to indicate obstruction, however, is distention. Gas under pressure is abnormal. While it does not always indicate a mechanical obstruction, its presence demands an explanation, and it is in the analysis of these abnormal shadows, considered in connection with the clinical picture, that the diagnostic value of the method rests. In the early stages distention is moderate.

A differential diagnosis from the X-ray plate at times presents many difficulties. Some of these the authors have been able to work out after critically reviewing their errors: others they are still unable to solve. In the case of obstruction in the large bowel the story is usually obvious, the colon assuming giant proportions, with the gas column ending sharply.

In a typical case of ileus one sees numerous coils of only slightly or moderately distended small bowel, associated with gas in the large intestine. The abdomen in ileus may be tightly filled with innumerable gas-filled coils, none of which exhibits the signs of great internal pressure. In some cases, however, the dilatation of the small intestine is extreme and the colonic gas small in amount. The case is then not radiographically distinguishable from mechanical obstruction.

F. B. SHELDON, M.D.

The Association of Chronic Ulcerative Colitis and Multiple Polyps. J. Arnold Bargen and Mandred W. Comfort. Ann. Int. Med., August, 1930, IV, 122.

In 10 per cent of cases of chronic ulcerative colitis multiple polypi develop eventually. This estimate is based on a study of 693 cases of ulcerative colitis.

Inflammatory disease or chronic irritation of the mucosa seems to play a significant part in the etiology. Microscopic examination of the polypi shows all stages of chronic inflammation, with numerous nests or groups of glands enclosed in a dense inflammatory network, and these findings raise the question as to whether or not these polypi are prone to undergo malignant degeneration.

The best method of examination is the use of the barium enema, supplemented by the use of the proctoscope. Polyposis in the presence of chronic ulcerative colitis may offer a grave prognosis.

Polyposis of the large bowel occurs after severe colitis or in longstanding, slowly pro-

gressing colitis, in which there is a tendency to recurrent severe exacerbations of the disease. The polypi contain large amounts of inflammatory tissue. The authors have had an opportunity to see their patients in severe exacerbations of bacterial chronic ulcerative colitis, with formation of polypi later, and finally with malignant disease.

C. H. DeWitt, M.D.

Multiple Diverticula of Small Intestine. John R. Boling. Jour. Am. Med. Assn., July 26, 1930, XCV, 267.

In 1925, the literature showed thirty-three cases of diverticula of the jejunum. Of this number, nineteen were multiple; only ten were found at operation.

One case is reported in which the roentgenograms were unsatisfactory. The terminal jejunum and ileum were studded with diverticula, springing from the mesenteric border of the intestine, and ranging in size from that of a pea to a walnut. An enterostomy was done in the jejunum and recovery was uneventful. A series of roentgenograms two months later failed to show the diverticula plainly enough for a definite diagnosis.

Charles G. Sutherland, M.D.

Physiologic and Chemical Studies Following Successful Total Gastrectomy for Carcinoma. Waltman Walters. Jour. Am. Med. Assn., July 12, 1930, XCV, 102.

Subtotal gastrectomy for carcinoma of the stomach has established itself as a procedure of relative safety, with excellent results for the cure of malignant conditions. When even the smallest amount of gastric wall has been allowed to persist, this portion increases in size until it becomes almost as large as a normal stomach.

Experimental studies have shown that alkalosis and depletion of blood chlorides occurred and were proportionate to the loss of these constituents in the acid gastric secretion. When incomplete intestinal obstruction was maintained after total gastrectomy in animals, and the excretion of acid and chloride by way of the stomach therefore was absent, there was little depletion of chlorides in the blood or little change in the carbon dioxide combining power of the blood.

In the author's case, the concentration of chlorides in the blood was not lowered and the carbon dioxide combining power of the blood remained practically normal over a period of more than four months. There has been some disturbance in the acid-base equilibrium, as evidenced by the absence of an alkaline tide. Studies made of chemical changes in the blood, and of the cell count over a period of four months do not reveal any appreciable change in the number of erythrocytes, in the content of the hemoglobin, in the carbon dioxide combining power, or in the concentration of blood chlorides or urea.

Charles G. Sutherland, M.D.

Congenital Diverticula in the Greater Curvature of the Fundus of the Stomach. Warde B. Allan. Canadian Med. Assn. Jour., July, 1930, XXIII, 43.

This is a case report of a white female, aged 43 years, who was admitted to the Montreal General Hospital. A diagnosis of coronary thrombosis was made, which was confirmed at autopsy.

The special point of interest is, however, the accidental finding at autopsy of a diverticulum in the greater curvature of the fundic portion of the stomach. The diverticulum was a globular pouching 4 cm. in diameter, and situated 6 cm. from the cardio-esophageal junction. It appeared to be made up entirely of mucous membrane and serosa. There was no evidence of old ulcer; it was evidently congenital. There had been no history of symptoms produced by the diverticulum.

L. J. Carter, M.D.

Imperforate Anus: A Method of Determining the Surgical Approach. Owen H. Wangensteen and Carl O. Rice. Ann. Surg., July, 1930, XCII, 77.

Atresia of the anal canal or lower portion of the rectum occurs approximately once in every 5,000 births. Clinically, casual inspec-

tion of the perineum in the newborn will usually demonstrate the presence of imperforate anus. The child normally takes his feedings in the usual manner for twenty-four hours before regurgitation commences. There is gradual distention of the abdomen. In some instances, internal fistulous communication exists with the bladder, urethra, or vagina. Early establishment of communication with the exterior is necessary in complete atresia of the anal canal or rectum. To date, no satisfactory method has been devised to determine whether or not the atresic bowel should be approached from below or above.

A roentgen-ray method is presented by the authors which proved of value in two cases. If the child is held upside-down in the inverted position by the lower extremities, the gas in the rectum will rise to the top and indicate the distance intervening between the rectal wall and the skin of the anal dimple, when a flat X-ray film is made. Roentgenograms included appear to be convincing.

F. B. MANDEVILLE, M.D.

A Proper Gastro-intestinal Examination. N. B. Newcomer, Elizabeth Newcomer, and C. A. Conyers. Colorado Med., July, 1930, XXVII, 257.

A proper gastro-intestinal examination must determine whether each and every portion of the gastro-intestinal tract is or is not diseased; also whether pathology elsewhere in the body is giving rise to gastro-intestinal symptoms. It is surprising how often it is necessary to make a careful examination of the kidneys by means of the X-ray in order to eliminate them as possible causes of such symptoms. In making such a proper examination, it is necessary to take a careful history, to make a careful physical examination, and to correlate these with the X-ray findings. It may be necessary to examine the stomach contents, the urine, and the blood. The X-ray examination should include the teeth, esophagus, stomach, duodenum, appendix, colon, and an extremely careful examination of the gall bladder. We must exclude all conditions above and below the diaphragm which may simulate gastro-intestinal disease, such as pneumonia, tuberculosis, carcinoma of the mediastinum or lungs, pleurisy, pneumothorax, abscesses in the lower lung, aneurysm, myocarditis, angina, arthritis or tuberculosis of the vertebræ, kidney lesions, pregnancy, etc. The diagnosis must explain all the symptoms and one must be on the alert for other conditions not causing symptoms.

W. W. WATKINS, M.D.

The *Ascaris Lumbricoids* of the Gastro-intestinal Tract Simulating Appendicitis. V. O. Abgarov. Vestnik Rentgenologii i Radiologii, 1930, VIII, No. 1, p. 93.

The author reports three cases in which he succeeded in demonstrating the presence of *Ascaris lumbricoids* in the gastro-intestinal tract by means of the roentgen rays. In two cases the worms were found in the small intestine; in the third case they were found both in the intestines and stomach. Roentgenologically they are recognized as narrow transparent bands within the lumen of the intestines amidst the opaque medium. Since they are most frequently found in the small bowels, it is important to make fluoroscopic observations shortly after the administration of a barium meal. The use of pressure during the fluoroscopic observations or during the taking of the roentgenograms will reveal the worms to greater advantage. The clinical manifestations of all the cases were strongly suggestive of appendicitis.

SAMUEL BROWN, M.D.

Changes in the Position of the Intestinal Tract by Processes Outside of It. H. Pansdorf and E. Kraas. Röntgenpraxis, July 1, 1930, II, 594.

A roentgen examination can give us a diagnosis of location and origin of extra-gastric and extra-intestinal processes by their indirect action on the gastro-intestinal tract. A very thorough roentgenologic examination of the entire intestinal tract may be necessary, especially considering the "mucosa-diagnosis." Only if the mucous membrane can be shown to be entirely intact, should one exclude a disease of the stomach and intestines. Dif-

ferent positions before the fluoroscope are essential and manual palpation is of great help. A large liver may cause a filling defect similar to that caused by a gastric carcinoma. A large spleen may cause a definite change in position of the stomach and intestines. Tumors of the pancreas may lead to a picture simulating a filling defect in the stomach. Enlarged kidneys lead sometimes to a compression and displacement of the colon. Retroperitoneal tumors may show the same behavior and can be differentiated only by a pyelogram. An enlarged uterus, large ovarian cysts, and other pelvic tumors usually push the small intestines upwards.

H. W. HEFKE, M.D.

Lymphoblastoma Involving the Stomach—Roentgenologically Considered. Howard E. Ruggles and Robert S. Stone. California and Western Med., July, 1930, XXXIII, 486.

Lymphoblastoma of the stomach is such a rare condition that no one roentgenologist is likely to see more than a very limited number of cases; therefore it is necessary to pool experiences. A review of the reported cases and of those here presented shows that a majority have been diagnosed as carcinoma. Surgery has very little to offer to either carcinoma or lymphoblastoma: X-ray therapy has a great deal to offer to the latter. If it were possible to differentiate these conditions without an exploratory operation, which has a high primary mortality in these often emaciated patients, it would be of great help. The object of this study is to determine if any such differentiation is possible.

It should be possible with any given lesion to study its pathology and from it predict the X-ray findings. On this basis, lymphosarcomata of the stomach should show the following changes roentgenologically: The earliest lesions, being simply mucosal invasions, should not interfere with form or function, and, therefore, not be demonstrable. The more extensive mucosal and submucosal invasions produce a wall of more rigid appearance, or, if large enough, a filling defect. This defect will be annular diffuse, rugose, or polypose, according to the type of the process. In these respects they may closely resemble carcinomata and polyposis. Junghaven, however, has pointed out the important fact that, owing to the late invasion of the muscular layers, there is a time in the development of lymphosarcomata when there is sufficient infiltration to produce filling defects or somewhat rigid walls, and yet peristalsis can be seen. This seems to be the only diagnostic sign possible from a pathological point of view. It does not, however, separate the polypoid type from benign polyposis, which differentiation must be made clinically. The advanced stages of lymphosarcoma when the muscle is involved closely simulate carcinoma, but the defects may be of an unusual type.

Eleven cases of lymphoblastoma of the stomach are presented from a roentgenological aspect, with the pathological findings necessary to explain the changes demonstrated by the X-ray. It is shown that there is no type of lesion or region of involvement characteristic of lymphoblastoma, and, therefore, no characteristic roentgen findings. When, however, gastric peristalsis persists with a lesion of the stomach it is most likely to be lymphoblastoma. Gastric polyposis in a patient clinically suspected of malignancy should be regarded as a lymphoblastic lesion and its response to X-ray therapy tried.

F. B. SHELDON, M.D.

Advances in the Study of Gastro-intestinal Disease. Joseph W. Larimore. Jour. Tennessee St. Med. Assn., July, 1930, XXIII, 233.

To the roentgen ray and its adaptation to the needs of gastro-intestinal examination may be credited much of our increased clinical knowledge of the alimentary tract. X-ray examination of the gastro-intestinal tract is now a matter of daily routine and is in danger of becoming commonplace. Conceptions of the anatomy of the alimentary tract have changed with the ability to study it in the living organism. The size, shape, and position of the stomach have been found to vary with the physical status of the individual, and also the motility varies directly with the bodily

habitus. The addition of the Graham dye test has been of inestimable value. The roentgenologic serial examination should include the entire tract by fluoroscopic and film examination six and twenty-four hours after the initial ingestion of the opaque meal, and later with an opaque enema. All the findings from this examination should be correlated with other clinical and laboratory data.

W. W. WATKINS, M.D.

GASTRO-INTESTINAL TRACT (THERAPY)

The Treatment of Gastric and Duodenal Ulcer. Frank H. Lahey. Jour. Am. Med. Assn., August 2, 1930, XCV, 313.

The incidence in the author's series was duodenal ulcer 85 per cent; gastric ulcer 10 per cent, and gastrojejunal ulcer 5 per cent. Hemorrhage had occurred in 18 per cent of the duodenal ulcers, in 18 per cent of the gastric, and in 32 per cent of the gastrojejunal ulcers. Obstruction occurred in 7.8 per cent of the patients with duodenal ulcers, 18 per cent of those with gastric ulcers, and 20 per cent of those with combined duodenal and gastric ulcers. Eleven per cent of the patients under treatment for ulcer have been operated on and the remainder treated medically.

There are certain fairly constant features associated with peptic ulcers, such as pylorospasm, hyperperistalsis, and hyperacidity. Pylorospasm is probably the causative factor in hyperperistalsis, hyperaccumulation of gastric secretion, and hyperacidity.

Any method of treatment includes in it prominently measures directed against pylorospasm. In the surgical treatment of peptic ulcer to-day, no measures are considered practical which do not attempt to alter or offset the effects of pylorospasm.

That the ulcer is the result of and not the cause of whatever physiologic change or changes accompany it, is suggested by the fact that complete relief from symptoms as well as healing of the ulcer frequently occurs without removal of the ulcer itself.

The essayist stresses the need of attention to all the painstaking details of any form of medical management, the necessity of patients accurately persisting with it over a long period of time, and the essential requirement that patients change their habits of life as to eating, smoking, drinking, and resting. Indications for surgery are: failure to obtain relief under medical management, perforation, hemorrhage in spite of good non-operative management, non-relievable pyloric obstruction, and malignant degeneration or suspicion of it in a gastric ulcer.

A large proportion of patients with pyloric obstruction occurring with active ulcer symptoms can be relieved of their obstruction by non-operative measures.

Of all gastric lesions coming to the clinic, about 50 per cent are frankly malignant and not to be confused with ulcer.

Patients with gastric ulcer are placed in hospitals on accurate medical management. As long as the gastric defect continues to diminish in size and symptoms are completely relieved, surgery is not indicated. If the lesion can be made to disappear entirely as shown by roentgen examination, it is obvious that surgery is not indicated. Otherwise the lesion is regarded as an intractable ulcer or an early carcinoma, and surgery is indicated.

A discussion of surgical procedures follows. A patient who has had an ulcer, whether operated on or not, is always a possible candidate for another ulcer. There is less likelihood of recurrent ulcer and better end-results when patients are placed in just as careful medical management as if they had not been operated on, and urged to modify their habits of life just as much as they would if placed on a non-operative medical management.

CHARLES G. SUTHERLAND, M.D.

Gastric Achylia: Differential Diagnosis with the Aid of Neutral Red. M. H. Streicher. Jour. Am. Med. Assn., August 2, 1930, XCV, 326.

Gastric achylia may be classified as false achylia and true achylia. In false achylia the psychic phase of gastric secretion is suppressed, so that no free acid appears for the

first hour, but an acid curve appears after sixty minutes. In true achylia the curve of secretion does not rise, and the free acid and ferments are absent throughout.

Achlorhydria means a depression of acid secretion in the stomach in which free acid is absent but a moderate total acidity with ferment acivity is present.

According to Rehfuss, in cases of spurious achylia gastrica and in cases of gastric carcinoma with achlorhydria, histamine acts as an effective agent in producing gastric secretion containing acid and ferments. The same property of gastric stimulation has been claimed for neutral red in the differential diagnosis between true and false achylia.

The neutral red test may be used as an aid in differentiating true and false achylia gastrica, not because the dye is employed in this test but because a prolonged period is necessary to perform the test. Neutral red tests may be advantageously employed as a test of gastric function, just as any fractional method may be employed over a long period of time (more than sixty minutes). Neutral red possesses little or no property as a stimulant of gastric acidity.

CHARLES G. SUTHERLAND, M.D.

GENITO-URINARY TRACT (DIAGNOSIS)

Intravenous Pyelography. Frank Kidd. Lancet, July 19, 1930, CCXIX, No. 5,577, p. 128.

The author reports seventeen cases in which uroselectan was used, satisfactory conclusions being obtained in eleven. The results were doubtful in three cases, unsatisfactory in three, and in one patient a diagnosis of tumor was proven by operation to be an error, when the involved kidney showed multiple abscesses.

The author believes that intravenous pyelography should be used in difficult cases in which cystoscopy and ureteral catheterization are difficult or contra-indicated, *e.g.*, if a ureter is blocked by stone or stricture, if severe cystitis is present, if urethral stricture prevents cystoscopy, or in cases suspected of having ureteral fistula. Profuse hematuria can also be studied to advantage by this method. Tuberculous involvements are thought to be more safely studied by this means than by ureteral catheterization. The drug cannot be given by mouth as it causes vomiting. No iodism results from the injection, because the substance is passed through the renal tubules and out of the body without giving off any ionized iodine.

In the author's series, one patient vomited during the injection, but the condition of the others gave no cause for anxiety, and there were no unpleasant after-effects. Swick recovered from 90 to 95 per cent of the original substance from the urine within eight hours after the injection. The drug should not be used when both kidneys are known to be severely damaged, and the blood urea should be determined before the injection in doubtful cases. New values of diagnostic criteria must be developed to secure a successful evaluation of this method.

The author followed the method of Swick and von Lichtenberg, in which roentgenograms were made of the urinary tract, fifteen, forty-five, and seventy-five minutes after the injection of uroselectan, and at later intervals, if necessary.

If both kidneys are normal, the bladder is full of the opaque substance in a few moments after the injection. At this time the kidneys are also visualized and the pelves faintly outlined. After half an hour the pelves are fairly well visualized. It may take hours for these results in cases in which renal tumor is present or inflammation exists. The pelvic and ureteral shadows are at no time as distinctly visualized as by ureteral pyelography.

M. J. GEYMAN, M.D.

Solitary Cyst of the Kidney: Report of Five Cases. Herman L. Kretschmer. Jour. Am. Med. Assn., July 19, 1930, XCV, 179.

The extremely interesting and relatively rare condition of solitary cyst of the kidney has been the subject of renewed interest during the past seven or eight years. In 1920, the author reported one case and reviewed 47 cases found in the literature. An unusually interesting group of papers has appeared on

this topic, more or less recently. Some cysts are congenital, while the majority seem to belong to the class of retention cysts following obstruction.

Five cases are reported, the roentgen and cystoscopic examinations being detailed in each.

In a good roentgen film the outline of the cyst can be demonstrated in a large number of cases. The pyelogram is not typical and is not constant. Cysts in the upper pole are not easily recognized in plain films; cysts arising from the lower pole are easily recognized from the roentgenogram.

CHARLES G. SUTHERLAND, M.D.

Intravenous Urography as a New Help for the Urological Diagnosis. Karl Hutter. Wien. klin. Wchnschr., July 10, 1930, XLIII, 879.

Eighty cases have been examined by means of uroselectan without an accident. This method is absolutely indicated in children, in cases with stricture of the urethra, with suprapubic fistula, and in all cases in which the introduction of ureteral catheters is impossible for mechanical reasons. The excretion of uroselectan also indicates the functional state of the kidneys. This method is valuable not only for the urologist, but also for the non-specialist in helping him to decide whether or not urological disease is present.

H. W. HEFKE, M.D.

Intravenous Urography: Better Visualization with Compression. Samuel Lubash. Am. Jour. Surg., June, 1930, VIII, 1229.

The author emphasizes three points in this paper: (1) Compression before and during X-ray exposure; (2) increase in the dose of uroselectan; (3) withholding of urination.

Compression is obtained by the use of the Hickey rubber bag, using only a moderate amount of compression. This is instituted immediately after the last injection of uroselectan and is allowed to remain until after the first film is taken. It is reapplied ten minutes before and during the exposure of the second film, and the succeeding films thereafter. The author is unable to explain the *rationale* of this procedure, but states that very much better films are obtained. Following Swick's lead, he now suggests a 60 gram dose of uroselectan instead of the original 40 gram dose. He also urges the patient to refrain from urination, at least until after the second exposure, if possible.

HOWARD P. DOUB, M.D.

The Action of Pituitrin on the Kidney Pelvis Demonstrated by Uroselectan. F. Reimann. Med. Klinik, June, 1930, XXVI, 960.

The author investigated the influence of pituitrin, given subcutaneously or intramuscularly, on the size and contractility of the kidney pelvis, as demonstrated by uroselectan. In all pyelograms of normal persons a distinct lessening in the size of the pelvis was noted, and the calices could be demonstrated about fifteen to thirty minutes after the administration of pituitrin. Studies concerning its influence on a pathological renal pelvis are as yet not numerous enough to allow one to draw conclusions.

H. W. HEFKE, M.D.

Intravenous Urography. Gonzalo Pedroso, in collaboration with Joaquin Chappotin, Pedro Sánchez Pessino, and Juan Embil. Anales de Cirugia, June, 1930, II, 216.

The term "intravenous urography" is used by the authors to designate the intravenous administration of uroselectan, while the term "retrograde pyelography" is employed to refer to the classical ureteral injection. The authors arrive at the following conclusions: (1) Intravenous urography is primarily a functional test; (2) it has decided advantages over retrograde pyelography, but it cannot replace the latter in every instance; (3) the images obtained by this method are usually less opaque and less sharp than those obtained by retrograde pyelography; (4) retrograde pyelography maintains an unquestionable superiority over intravenous urography when renal tumors and certain ureteral lesions

are suspected; (5) intravenous urography appears to be contra-indicated in cases of advanced renal insufficiency; (6) in a series of cases it was shown that the time of elimination of uroselectan was equal to the time of elimination of urea and phenolsulphonephthalein; (7) up to the present time the authors have not observed any untoward symptoms after intravenous urography.

The paper is exceedingly interesting, quite complete, and generously illustrated.

M. VIAMONTE, M.D.

Intravenous Pyelography as a Test of Renal Function. Kenneth Heritage. Lancet, July 19, 1930, CCXIX, No. 5,577, p. 132.

The author feels that the test of renal function by intravenous pyelography depends more upon the time that the shadows appear than the density of secreted uroselectan, because in many cases, largely normal, the dye is secreted so rapidly that films show only faint shadows of pelves and ureters, whereas the bladder shadow fills the pelvis. He suggests temporary compression of the ureters at the level of the sacroiliacs, and uses a pad and rubber bag similar to that used for renal compression. Prolonged or too great compression should be avoided, and frequently five minutes suffices to obtain satisfactory outlines of the calices. This method, of course, is of no help in stout patients.

The author condemns the use of intravenous pyelography as a short-cut to urinary diagnosis.

M. J. GEYMAN, M.D.

GYNECOLOGY AND OBSTETRICS

Fetal Cephalometry *in Utero:* A Method for Estimating the Occipitofrontal Diameter, and a Statistical Study of Cephalic Measurements in One Hundred and Forty-nine Unmolded Heads. Herbert Thoms. Jour. Am. Med. Assn., July 5, 1930, XCV, 21.

A method is described which has proved satisfactory for measuring the occipitofrontal diameter *in utero.* A report is made of a statistical study of unmolded heads of new-born infants to establish the relationship of the occipitofrontal diameter to other important cephalic measurements.

The method is essentially an adaptation of the method of roentgen pelvimetry published in May, 1929. After the plane through which the occipitofrontal diameter passes has been established and the distance above the sensitive plate measured, the exposure is made with the tube at a thirty-six inch distance, centering directly over the mid-point of the diameter. A perforated lead plate is introduced in the same plane as that occupied by the occipitofrontal diameter. A flash is made in the previously exposed plate. The image of the fetal head shadow and a series of dots representing the centimeter scale in the plane of the occipitofrontal diameter will be seen on development of the roentgenogram.

CHARLES G. SUTHERLAND, M.D.

Actual Problems in Gynecological Radiation Therapy. F. Seisser. Strahlentherapie, 1930, XXXVI, 671.

The author discusses briefly the technical, biological, and clinical principles of radiation therapy in gynecology. He does not recommend the so-called temporary sterilization by roentgen rays or radium, and believes that there is no direct effect of radiation on uterine fibroids.

The article closes with an emphasis on the importance of individualized treatment in all cases subjected to radiation therapy.

ERNST A. POHLE, M.D., PH.D.

The Woman's Bill of Rights. E. G. C. Williams. Illinois Med. Jour., June, 1930, LVII, 415.

"If a woman has a menstrual disturbance which is preventing her from leading a comfortable and useful existence, is it her privilege to go into a voluntary menopause, or should she be required to wait and let Nature take its course?"

The writer calls attention to some aspects of menstrual disturbance that receive too little attention from the medical profession, and discusses the medical, sociological, and economic phases of the production of an artificial

menopause. From his experience he concludes that an amount of X-radiation giving a saturation dose of 600 r at the depth of the ovaries will, in most cases, produce a complete menopause with little mental and nervous disturbance. Each case must be judged and accepted on its own merits.

"Let the old catamenial law be tempered with reason and administered with justice to the patient, and may we discuss freely and openly the adding to a woman's bill of rights a provision that it is the privilege of any woman to voluntarily enter the climacteric if her catamenial status is detrimental to her happiness, health, or community usefulness."

C. H. DeWitt, M.D.

Irregular Uterine Bleeding at the Time of Menopause. John H. Mullin. Delaware St. Med. Jour., June, 1930, II, 95.

Irregular uterine bleeding at the time of the menopause is not normal. Every patient having metrorrhagia or abnormal vaginal discharge should be examined thoroughly to discover the cause; if the symptoms warrant it and the patient is not a poor surgical risk, hysterectomy should be done even if malignancy is not found by curettement.

(*Note:*—This paper does not give sufficient consideration to treatment by radiation in nonmalignant conditions.)

With regard to the treatment of malignant conditions, the choice between radium, X-ray, and surgery is not always easy. Each has its field in which it is clearly the best treatment, but the fields overlap.

(*Note:*—The paper does not show evidence of a very accurate knowledge of the indications for radiation treatment in uterine malignancy.)

W. W. Watkins, M.D.

HEART AND VASCULAR SYSTEM (DIAGNOSIS)

On the Horizontal Orthoprojection of the Heart. T. Klason. Acta Radiologica, 1930, XI, No. 59, p. 57.

To obtain further information regarding the cardiac chambers in different projections, the author made anatomical studies of frozen sections of the thorax, in horizontal and sagittal planes. He also examined five cadavers in which the heart had been fixed *in situ*. One hundred and fifty normal cases were then studied by the author. He describes his method of obtaining an orthoprojection of the heart in horizontal planes, with the patient in an upright position. A series of tables gives normal measurements obtained from orthodiagrammatic study, as well as measurements in horizontal orthoprojection. He also discusses pathological variations in size and shape of the heart as determined by horizontal orthoprojection.

M. J. Geyman, M.D.

Calcification of Blood Vessels. Franz Melchart. Röntgenpraxis, July 15, 1930, II, 657.

Arteriosclerotic calcification of arteries in older persons is a common finding in roentgenograms of extremities and the pelvis. It is rare in younger individuals, and has been described in cases of osteosclerosis, severe osteomyelitis, fragilitas ossium, and lately after the administration of Vitamin D.

A case of a woman thirty-eight years of age is described, with very marked calcification of the vessels and smaller arteries. Vitamin D, which had been given to the patient, may be an etiologic factor in this condition.

H. W. Hefke, M.D.

MASTOID

Acute Mastoiditis. Henry B. Hitz. Wisconsin Med. Jour., June, 1930, XXIX, 316.

Usually middle ear inflammation, with involvement of the mastoid, comes on rapidly. Within twenty-four hours, good X-ray films will usually show a diffuse blurring on the affected side, as against the clearly marked well side. The cases with the classical symptoms of mastoiditis are the exception rather than the rule. Unquestionably many an individual has lost his life from meningitis, or other complications, while the physician was awaiting the development of classical symptoms. Much may depend upon the character of the bone

structure of the mastoid. [This can be determined only by X-ray examination.—W. W. W.] It may have a thick-walled outer table, small-celled, with a thin inner wall; or a thick-walled, large-celled outer table, with a thicker inner table; or thin-walled throughout, with large, eggshell, bubble-like cells widely disseminated; or completely eburnated, with a few small cells close to the inner table.

(*Note:*—The author does not so state, but only by a thorough X-ray examination can the surgeon determine what sort of mastoid his patient has, and, therefore, what the course of infection is likely to be.—W. W. W.)

W. W. Watkins, M.D.

Comments on the Prevention and Early Diagnosis of Mastoid Disease. Emil R. Mayerberg. Delaware St. Med. Jour., June, 1930, II, 101.

Much can be done for cases with an acute inflammation of the middle ear, if they are seen early, and mastoid disease can frequently be prevented by early recognition and proper treatment. Most of the patients lost may be truly said to have died because of the failure of "classical" signs of redness, tenderness, and swelling over the mastoid, which do not appear in the most dangerous cases. The author has become increasingly impressed with the value of X-ray findings when properly interpreted. By this method one can determine the anatomic type of the mastoid, the condition of the bone structure, the location of the lateral sinus, and whether or not the cells contain air or some exudate. The whole clinical picture must determine the advisability of operation, but the X-ray findings have a very positive value.

W. W. Watkins, M.D.

OFFSPRING, EFFECT ON

X-rays and Germ Injury. Hans Duncker. Strahlentherapie, 1930, XXXVII, 142.

X-rays and Germ Injury: Its Relation to Gynecologic Therapy. Heinrich Martius. Strahlentherapie, 1930, XXXVII, 164.

Duncker discusses the present status of our knowledge of the genetic changes produced experimentally by roentgen rays. The investigations of Hertwig, Muller, Patterson, and others are fully related.

Martius reviews the literature on the injuries to the offspring caused by irradiating the ovaries of the mother. He cautions against unnecessary diagnostic exposures of the pelvis, particularly during pregnancy, and opposes temporary sterilization by roentgen rays or radium.

Ernst A. Pohle, M.D., Ph.D.

Late Injury to the Offspring by Indirect Radium Irradiation. Fritz Dautwitz. Strahlentherapie, 1930, XXXVI, 686.

Following a review of the literature concerning the injury of the offspring due to irradiation of the mother, the author relates in great detail the history of a case which came under his observation in March, 1926. This woman developed a goiter at the age of twenty, which did not respond to iodine medication. In October, 1925, a struma in size larger than a man's fist was removed because it occasioned difficulty in breathing. In December, a swelling appeared in the skin which kept on growing, until, in March, 1926, a biopsy led to the diagnosis of angiosarcoma. Radium treatment to the neck was then started. The patient was pregnant in approximately the fifth month. The second series was administered in July, 1926, and on August 9, 1926, the patient was delivered of a normal girl, 51 cm. in length and weighing 3,800 grams. Mother and child were well until February, 1927, when a recurrence developed in the region of the right neck of the mother. Radium was given again, followed by prompt relief. In October, the patient reported that she had last menstruated in April. On January 23, 1928, a normal boy was born, weighing 3,600 grams, 53 cm. long. The first child could not walk when over one year old. In the Summer of 1928, spastic paresis developed in the legs and arms, and according to the report of the family physician, death occurred from sclerosis of the brain.

Another radium treatment to the mother was necessary because of a recurrence in December, 1928. Early in 1929, the patient had

a cyst in the right adnexa removed; she recovered well and was still free of recurrence in April, 1929. The second child developed and showed no abnormalities.

The author then discusses at length, the possibility of a radium injury to the first-born child, although the generative organs of the mother had not been irradiated directly. The total dose of radium applied over the neck and thorax was as follows: March, 1926, to April, 1929, seven series, 45,857 mg.-hrs., *i.e.*, 9,823 mg.-hrs. in March and July, 1926, during the second half of the first pregnancy; 12,228 mg.-hrs. in March, 1927; 8,216 mg.-hrs. during the second pregnancy, and 15,590 mg.-hrs. after the second delivery.

ERNST A. POHLE, M.D., PH.D.

RADIUM

Measurement of the Distribution of Gamma Rays around a Four-gram Mass of Radium: Report from the Physics Department, Westminster Hospital. H. T. Flint and L. G. Grimmett. Brit. Med. Jour., July 19, 1930, No. 3,628, p. 98.

This paper describes the method used in an attempt to measure accurately the gamma radiation field, in air, of the radium "bomb" in use at Westminster Hospital, London. The measurement is arrived at by combining an ionization chamber and gold leaf electroscope into one small instrument, thereby dispensing with connecting leads.

A table is printed giving a typical set of readings taken along a horizontal line 4 cm. below the bomb and intersecting its vertical axis. The isometric lines (curves of equal times of leak, "isodoses") per 100, 95, 90, etc., arbitrary units, were drawn by linking up the points on the various levels for which the times of leak were 5 seconds, 5.26 seconds, 5.55 seconds, etc., these numbers being inversely proportioned to 100, 95, 90, etc. A chart is given showing on a reduced scale the gamma-ray isometrics taken in a vertical diametral plane parallel to the bomb supports. It is accurate to within 5 per cent. The chart enables skin doses to be read off in arbitrary units.

Of the various units now in use in connection with the measurement of dosage in gamma-ray therapy, two which could be applied to this work are the international r-unit and the absorption unit (energy absorbed per cubic centimeter per milligram hour).

WALLACE D. MACKENZIE, M.D.

The Treatment of Keloids and Hypertrophic Scars. Albert Simons. Strahlentherapie, 1930, XXXVII, 89.

The author describes a method of treating keloids by implantation of small rods made of Thorium X (similar to our radon seeds). He feels that this method is applicable in cases in which external irradiation must fail. It is also possible to obtain high doses at a depth without over-exposing the skin. The beta rays, which are very suitable for the treatment of hypertrophic connective tissue, can be used, even in the deeper tissue parts. The protracted treatment has, according to our present knowledge, also definite advantages.

The clinical results in twenty-one cases are then recorded, accompanied by photographs of a number of patients before and after treatment. These results were excellent in thirteen cases, four patients were improved, two are still under treatment, and two did not respond.

ERNST A. POHLE, M.D., PH.D.

Distribution of Radiation from Clinical Radium Tubes. S. Russ and Dorothy F. Clephan. Lancet, Aug. 9, 1930, CCXIX, No. 5,580, p. 286.

Numerous tests were made of the effect of radium needles on photographic plates, with the needles arranged in different positions and at different distances. During these tests it was discovered that the concentration of radium inside the individual tubes is not always uniform, and photographic tests on individual tubes have shown that in some cases it can safely be said that the inequalities in strength of radium along the lumen of the tubes are such as to militate against their proper therapeutic use. A few samples of autophotographs of individual tubes are reproduced, as well as

the photographic effect of needles arranged in different groupings. Because of the marked inequalities in distribution of radium in some of the tubes used, the authors suggest that purchasers of radium may find it necessary in the future to insist upon guarantees relating to the distribution of radium in tubes, as well as certificates of purity and quantity.

(*Note:*—This is of more importance in England to-day than in the United States, as long narrow needles with very small amounts of radium are being used extensively there in the treatment of carcinoma of the breast.)

H. J. Ullmann, M.D.

The Treatment of Carcinoma of the Tonsil by Radium, and a New Method of Application. Hassan Kenan. Strahlentherapie, 1930, XXXVI, 807.

The author describes a radium applicator consisting of a mold as used by dentists in conjunction with a small metal tube through which a copper wire is inserted. The radium is attached to the end of the wire. This device permits treatment over a long period of time without interfering with the feeding by mouth. A photograph of the mold is appended.

Ernst A. Pohle, M.D., Ph.D.

Radium in Gynecology. Brit. Med. Jour., March 1, 1930, No. 3,608, p. 390.

Malcolm Donaldson speaking: In view of the imperfect knowledge of the fundamental facts governing radiosensitivity it was not surprising that most technics were empirical. From clinical observation it appeared that for certain types of growth, particularly slow-growing tumors, it was better to apply a low intensity for a long time than a high intensity for a short time.

Glands were a difficult problem, but the Columbia wax method of placing the radium over the whole inguinal area at a distance from the skin of 1 cm. has proven probably the most efficient at present available.

A rapidly growing tumor, such as chorion epithelioma, should be treated first by X-rays, and then, if the primary focus is not very extensive, radium should be used in addition.

J. E. A. Lynham speaking: The removal of septic foci, and the use of vaccines, tonics, ultra-violet radiation, and hypodermic or intramuscular medication, are recommended as of possible assistance.

Wallace D. Mackenzie, M.D.

Radium and Roentgen Rays as a Factor in Producing Mutations. H. Stubbe. Strahlentherapie, 1930, XXXVII, 124.

This is a brief discussion of the literature on the subject, followed by a preliminary report of the author's own investigations. Those interested in the subject are referred to the original for details.

Ernst A. Pohle, M.D., Ph.D.

Indications for the Use of Radium in Gynecology. Gerry R. Holden. Southern Med. Jour., July, 1930, XXIII, 662.

Many principles governing the use of radium in gynecology have been more or less universally accepted. The judgment of the gynecologist must play a great part in their application. With regard to malignancy of the cervix, the pronouncement of the committee from the American College of Surgeons justifies the faith of those who for years have felt that just as good results follow the use of radium as follow extensive operations. With regard to myomata, perhaps the majority of them should be treated surgically. But myoma calls for fine discrimination and good judgment on the part of the gynecologist, who should decide upon the type of treatment after exhaustive study of the patient. Careful gynecological examination and accurate diagnosis is the important procedure in using radium; the technic of radium administration is easy as compared with the preliminary investigations which should precede its application.

W. W. Watkins, M.D.

The Use of Radon Seeds in the Treatment of Carcinoma. H. S. Souttar. Brit. Med. Jour., Aug. 23, 1930, No. 3,633, p. 273.

Radon, or radium emanation, is a heavy gas of atomic weight 222, and is formed by the decay of radium at an absolutely constant rate, which is independent of the physical condition

of the radium, its solution, temperature, or pressure. The amount of radon in equilibrium with one gram of radium is defined as one curie, and the volume of this very potent source of energy, the physical equivalent of 1,000 milligrams of radium, is only 0.6 of a cubic millimeter. It will thus be seen that we have here the means of packing an extremely powerful source of radiation into very small compass.

All the evidence at present available goes to show that the effect produced upon a tumor is proportional to the total energy delivered, and that it is a matter of apparent indifference within certain limits whether this energy is produced slowly or rapidly, or whether its rate of production is constant or diminishing.

It is usual to collect the radon in fine glass capillaries, but these must be screened by metal sheaths to cut off beta rays, which have no selective action on the cells of carcinoma and produce a general local necrosis of the tissues. The most effective screen is platinum, and with a platinum sheath whose wall is 0.3 mm. in thickness, all but a very small fraction of the beta rays are absorbed. It has been found, however, that with such small amounts of radon as are used in seeds—usually from 1 to 2 millicuries—silver of the same thickness forms a perfectly satisfactory screen at a fraction of the cost, while it is an old observation that silver, owing to its slight antiseptic properties, is better tolerated in the tissues if left in permanently. The only exception is in the case of a growth close to a mucous or cutaneous surface, and here platinum should be used, as these surfaces are peculiarly sensitive to beta rays. The seeds may be attached to fine silk threads to be removed, but the author personally adopts this course only in such special regions as the eyelids. In most regions the seeds may be left in permanently without any ill effect.

In general, the aim in view is to produce a nearly uniform radiation of the region under treatment by as accurate a "random" distribution as it is possible to obtain.

It is a generally accepted standard of dosage that one millicurie of radon during its decay will produce a gamma radiation sufficient to destroy all carcinoma cells within a distance of 0.5 centimeters.

It is not usually realized how considerable the effect of cross-fire may be. A formula is given to calculate the amount of radon required to produce unit radiation in a tumor of given size. The seeds are introduced through a fine cannula by means of a plunger. After each introduction the cannula is withdrawn a short distance, say, 2 cm., and another seed is introduced. In this way the linear distribution of seeds can be made with great accuracy and with no further trauma than is involved in the first introduction of the cannula. Further parallel rows of seeds can be similarly introduced, or several rows may be made to radiate from one puncture. A diagram is given showing the magazine introducer used by the author.

Special considerations in the treatment of tumors of the tongue, breast, rectum, and esophagus are illustrated in turn.

WALLACE D. MACKENZIE, M.D.

What can we Expect from Radium in the Treatment of Cancer? J. Murdoch. The Lancet, May 17, 1930, CCXVIII, No. 5,568, p. 1056.

This is a long paper, and is a descripton of the method and result of the work at the University Clinic of Brussels. The author takes up in detail cancer of the skin, lips, tongue, and the cervix, and the influence of radiation on other forms of cancer, and the cancer campaign in Belgium. His dose unit is the energy unit of the C. G. S. system, and is expressed in the amount of energy absorbed per unit volume of tissue, that is, in ergs per cubic centimeter. A dose of 450,000 ergs per cubic centimeter produces a slight erythema and pigmentation, practically the same as the one obtained with 600 International r-units given in one dose with 180 kilovolts and 0.5 millimeter of copper and one millimeter of aluminum filtration. For X-rays, however, this reaction is produced only after the administration of 96,000 ergs per cubic centimeter. With radium, a dose of 550,000 ergs per cubic centimeter causes a frank erythema not followed

by desquamation, but by brown pigmentation. A dose of 600,000 causes a deep red erythema, followed by slight desquamation and deep pigmentation, and from 700,000 to 900,000 causes a strong radio-epidermitis, with formation of blisters and deep pigmentation. It is the maximum dose used in treating skin tumors.

The general basis of treatment is long exposure (up to several days), with small amounts of radium, usually heavily filtered. In cancer of the skin and lips, the results where there are no glandular metastases, are very encouraging. The author reports about a 90 per cent cure of cutaneous cancers of the face and lips, and of the deeply infiltrating tumors, about 50 per cent, but this last class includes a large percentage of hopeless and quite inoperable cases. He believes that cancer of the skin is never too large nor too advanced for treatment by radium therapy. For cancer of the tongue the method originated by Regaud is used, and he quotes Regaud's statistics of 50 per cent of all cases cured of the local lesion, and 25 per cent of all cases, both operable and inoperable, with permanent recovery.

The author is rather pessimistic regarding the successful treatment of glandular metastases. The Regaud technic is that used for cancer of the uterine cervix with minor modifications, which he describes. The intra-uterine tube is left in place for nine days. The amount of radium is from 6.66 milligrams of radium element to double this amount, with a filtration of one millimeter of platinum. The larger amount of radium is used in cases in which the canal is long and the arrangement of the two tubes is in tandem. Vaginal tubes are left in place five days. Two tubes are used, each of 13.33 milligrams with two millimeters of platinum, and are contained in cork stoppers of the Regaud type, which insure a distance of one centimeter between the walls of the tubes and the tissues.

Murdoch quotes the published statistics of Forssell and Regaud to show that it is possible to cure 40 per cent of all the operable cases, to save 16 per cent of all inoperable cases, and believes that the results will improve in the future, as the technics have been perfected since 1923, and that future statistics will reflect these improvements. The best results in cancer of the esophagus, so far a two years' survival, have been secured by external irradiation with X-rays. Cancers of the stomach and the intestine do not respond well to radium therapy. He has seen some interesting inoperable cases improved by roentgen treatment, but the time elapsed is too short to warrant a definite opinion. Cancer of the rectum is also highly radioresistant, and the results obtained are very unequal. The authors named are not yet ready to report on the value of post-operative radiation in carcinoma of the breast.

The paper is very interesting and should be read by everyone working with cancer, whether he is using radium or not, for there is still considerable ignorance among the profession as to what can be done in the inoperable types of malignancy.

H. J. Ullmann, M.D.

ROENTGEN THERAPY

Radiation Therapy of Malignant Tumors in Sweden, with Special Consideration of Radiumhemmet. Gösta Forssell. Strahlentherapie, 1930, XXXVII, 215.

This excellent article is a German translation of the Forssell-Mackenzie-Davidson Memorial Lecture. It is published in English in the *British Journal of Radiology*, May, 1930, III, No. 29, p. 198.

Ernst A. Pohle, M.D., Ph.D.

The Present Status of Radiation Therapy in Pediatrics. Ernst A. Pohle and Horace K. Tenney. Jour. Michigan St. Med. Soc., July, 1930, XXIX, 500.

In pediatrics there are a number of conditions amenable to X-ray or radium treatment; in others, the results are doubtful. The clinical groups discussed include *(a)* glands of internal secretion; *(b)* tuberculous glands; *(c)* blood diseases; *(d)* skin diseases, and *(e)* inflammatory conditions. Aldrich suggests that the disturbances relieved by treating the thymus are related to smooth muscle balance,

which may enlarge our conception of indications for treating the thymus. The following indications are given: stridor, cyanosis not due to heart disease, pylorospasm. Small doses of from 30 to 75 r, which may be repeated several times, are advised. Toxic goiter in children has a high surgical mortality and conservative treatment with radiation should be tried first. A safe dose would be 75 to 100 r over each lobe, which may be repeated in from two to five days. Tuberculous glands may be treated by X-rays of moderate penetration, from 50 to 75 r, repeated two or three times at intervals of from three to ten days. Blood diseases are treated much as in adults, there being palliation in chronic leukemia and Hodgkin's. Of skin diseases the most important group is the nevi, which yield often enough to radium to make this method worth trying. Of inflammatory conditions, the authors especially name acute cervical adenitis, which should have small doses of from 30 to 75 r. Accurate measurement of dosage and a conservative attitude in administering radiation to children is urged.

W. W. Watkins, M.D.

Radiation Therapy as a Complete or Partial Substitute for Surgery in the Treatment of Carcinoma of the Uterus, Vagina, and Ovaries. James Heyman. Strahlentherapie, 1930, XXXVII, 254.

Heyman, the well known co-worker of Forssell, presented this paper before the Clinical Congress of the American College of Surgeons, in Chicago, October 14–18, 1929. The English reader will find it in *Surgery, Gynecology and Obstetrics*, January, 1930, L, 173.

Ernst A. Pohle, M.D., Ph.D.

Late Injury to the Lens (Cataract) after Roentgen and Radium Treatment. F. S. Grosman. Vestnik Rentgenologii i Radiologii, 1930, VIII, No. 1, p. 81.

A case is described of a woman, 32 years of age, who suffered from cancer of the nose which was treated energetically with X-ray and radium. After five years, following a complete cure of her affection, cataracts of both eyes developed which required surgical interference. After a thorough analysis of the possible etiological factors, the author came to the conclusion that the formation of the cataracts was due to X-ray and radium treatment. He supports his conclusion from similar case reports in the literature (a total of 20 cases) and experimental work. He believes that this complication is more frequent than is generally recognized, and that a thorough ophthalmological examination would reveal its presence more often. Several of his own cases, after from four to six years following treatment, revealed abnormal changes in the lens on ophthalmological examination.

Samuel Brown, M.D.

Principles of Roentgenotherapy: VI.—Roentgen Therapy in Internal Medicine. Ernst A. Pohle. Wisconsin Med. Jour., June, 1930, XXIX, 332.

Paper No. 6, on the Roentgen Therapy in Internal Medicine, covers the application of this method to lung tuberculosis, bronchial asthma, pneumonia, circulatory diseases, blood diseases, Hodgkin's, the spleen, polycythemia, gastro-intestinal tract, internal secretions, infectious diseases. Only carefully selected cases of lung tuberculosis should be treated, using a single dose of 50 r to 60 r of moderate penetration. In bronchial asthma a larger dose of more penetration may be given. Gastric hyperacidity is treated by followers of the Vienna school with fairly heavy doses of from 300 to 400 r at 150 K.V. In most of the conditions mentioned, caution and conservatism are advocated, although undoubtedly there is a developing field for roentgenotherapy in internal medicine.

W. W. Watkins, M.D.

Principles of Roentgenotherapy. VII.—Roentgen Therapy in Surgery. Ernst A. Pohle. Wisconsin Med. Jour., July, 1930, XXIX, 378.

This seventh paper in this series treats of the surgical lesions in which radiotherapy is commonly recognized as of benefit. Regarding breast cancer, he quotes Holfelder's tech-

nic, but states his preference for a single subtoleration dose (500 r), with operation within five to ten days, or the saturation dose for two weeks, with operation three to five days after the last exposure.

Consideration is given in this paper to carcinoma of the lip, malignant growths in the thyroid, lungs, esophagus, stomach, colon, prostate, bladder and penis, sarcomas, inflammatory processes, and surgical tuberculosis. As examples of the outstanding problems yet remaining for future research, he mentions the value of pre-operative radiation of breast cancer, the effect of irradiation on the healing of wounds, and the most efficient treatment of bone tumors.

W. W. WATKINS, M.D.

The Diazo Reaction after Roentgen Treatment of Lymphogranulomas. K. Tschilow. Med. Klinik, Aug. 1, 1930, XXVI, 1151.

In six cases of lymphogranuloma (Hodgkin's disease) after treatment with roentgen rays, the Diazo reaction in the urine was found either markedly increased or positive after a previous negative reaction, while in cases of lymphosarcoma, glandular tuberculosis, or carcinoma the reaction remained negative. These cases are described in detail. The effect of the X-rays on the Diazo reaction can well be applied for the differential diagnosis between Hodgkin's disease and other clinically uncertain tumors. The number of the cases is too small, in the author's opinion, to state that the Diazo reaction must always be positive after radiological treatment of Hodgkin's disease.

H. W. HEFKE, M.D.

X-ray and Radium in the Treatment of Uterine Fibromyoma and Benign Menorrhagia. M. A. Thomas. Ohio St. Med. Jour., July, 1930, XXVI, 599.

During twenty-five years radiation has come with many gynecologists to be the treatment of choice in this type of case. Clark, Norris, and Miller estimate that it is to be used in 25 to 30 per cent of the cases; others who specialize in radiation give estimates up to 80 per cent. Béclère has treated 700 cases with X-ray, with failure in 1 per cent, and states that "roentgenotherapy is contra-indicated only in cases in which for some urgent reason, surgical intervention becomes absolutely necessary." Among the contra-indications recognized in this country, the most important are *(a)* necessity for positive diagnosis (if it is not possible to rule out ovarian cyst, malignancy, adnexal disease, pregnancy, etc., irradiation is not advised); *(b)* pedunculated subserous or submucous fibroids; *(c)* size of tumor has been given as governing treatment, but Kelly found that in 60 per cent of tumors larger than a five months' pregnancy, the mass reduced satisfactorily; *(d)* age, in cases in which it is desirable to preserve menstrual function. The choice between X-ray and radium is generally dependent on circumstances and personal preference, as there is no essential difference in the final results.

W. W. WATKINS, M.D.

Roentgen Treatment in Disease of the Tonsil. G. Schulte. Strahlentherapie, 1930, XXXVI, 708.

A review of the literature revealed the fact that radiation therapy of tonsillar disease is not practised so much in Germany as in other countries. The author has treated hypertrophic tonsils since 1924, with the technic stated below. For children: 140 K.V., 4.0 Al, 147 r; for adults: 210 K.V., 1.0 Cu + 1.0 Al, 170 r; 6 cm. × 8 cm. field to left and right neck, at 30 cm. F.S.D. If necessary, this dose was repeated after four and after eight weeks. Large and fibrous tonsils did not respond well and were, therefore, excluded from irradiation.

A statistical survey shows that during the last six years, 132 children (2 to 14 years old) and 125 adults were treated. Twenty-eight patients were still under treatment at the time of writing the report, and 40 patients could not be traced. This leaves 189 cases for evaluation. Ninety per cent of these were cured, 6 per cent were improved, and 4 per cent were not improved. In about two-thirds of all cases, two series of X-ray therapy were re-

quired. In the remaining one-third, one, three, or four series had to be given. Emphasis is laid upon the fact that patients suffering from repeated tonsillitis are particularly suitable for roentgen therapy.

ERNST A. POHLE, M.D., PH.D.

A Case of a Late Roentgen Ulcer Following Roentgenoscopic Study. A. G. Strelkov. Vestnik Rentgenologii i Radiologii, 1930, VIII, No. 1, p. 89.

The case described is of a male patient 29 years of age, who suffered from a gastric ulcer and a diaphragmatic hernia. During a short period, in December, 1926, and January, 1927, the patient underwent numerous roentgenoscopic studies, and finally was operated upon and made a good recovery. In April, 1928, an ulcer appeared on the back measuring 7.5×7.5 centimeters. The character of the ulcer was that of dry gangrene. After a thorough analysis of the etiological factors the author came to the conclusion that the ulcer was due to the excessive use of the roentgen rays during the examinations of the patient. It finally healed under the application of therapeutic measures.

SAMUEL BROWN, M.D.

Radiation Treatment of Uterine Fibroids and Other Non-malignant Uterine Hemorrhage. J. Donald MacRae, Jr. Southern Med. and Surg., June, 1930, XCII, 413.

These cases come first to the general practitioner, the surgeon, or the gynecologist; the radiologist sees them only when they are referred to him. It is his duty, therefore, to inform his fellow practitioners about the type of cases he can help and what results are to be expected.

Uterine fibroids and non-malignant uterine hemorrhage from other causes are amenable to radiation therapy, when properly selected, in a very large percentage of cases. The necessity for accurate diagnosis before beginning treatment is emphasized. A diagnostic curettage should be done in all women over forty years of age. The injection of lipiodol into the uterine cavity is a useful procedure in diagnosis. The chief indication for irradiation is uterine hemorrhage. There is need for balanced judgment as to the benefit offered by radiology or surgery. High voltage X-ray and radium have practically the same effect on the tissues, and the reasons for choosing one or the other are based chiefly on the convenience of delivering the one or the other at the site of pathology or the organ to be treated.

W. W. WATKINS, M.D.

The Prognosis of Adenocarcinoma of the Uterine Cervix Under Radiation Treatment. Fr. Keller. Strahlentherapie, 1930, XXXVII, 349.

During the period 1915 to 1929, 463 cases of carcinoma of the cervix were seen in the author's clinic. Nine of these cases were adenocarcinoma; in not a single case was it possible to obtain a permanent cure. The average duration of life from the beginning of the treatment was 15.4 months, which is about the same for treated or untreated cases, in spite of the fact that four of the five cases were operable. In three of the four patients who had not been observed as long as five years, a clinical cure was obtained by combining radium and roentgen treatment. The prognosis of adenocarcinoma of the cervix, therefore, is poor, although the more favorable results with the modern technic look encouraging.

ERNST A. POHLE, M.D., PH.D.

X-ray Injury Following Epilation in Hypertrichosis. Karl Hoede. Strahlentherapie, 1930, XXXVI, 727.

The use of roentgen rays in cases of hypertrichosis is definitely contra-indicated. More or less general agreement on this subject has been reached in this country and the majority of Continental physicians is adopting the same stand. Two cases observed by Hoede illustrate the danger of the procedure most clearly. A girl received X-ray therapy at the age of eighteen over the left and right cheek, lips, and lower chin. The doses are given in detail: over the period of one year, 2½ E.D.

were given to the left cheek; during five months 2 E.D. to the right cheek; during five months 2½ E.D. to the lips, and during six months, about 2 E.D. to the lower chin. The filtration was from 2 to 3 mm. of aluminum. In 1928, two years after the exposure, small ulcers formed in several spots on the irradiated areas. In December, 1929, following osteomyelitis of the lower jaw due to an abscessed tooth, an ulcer about 1.7 by 1.9 cm. appeared within an indurated area of the size of the palm of the hand.

The case is analyzed by the author, who concludes that although the doses applied were not excessive, there is no doubt as to the late injury. In his own clinic, in 1919, epilation by roentgen rays for hypertrichosis has been tried out in only one case. This patient was re-examined in 1929 and showed atrophy of the skin, pigmentation, and telangiectasis in the irradiated area on the chin. In her case, exposure to extreme cold in the Winter of 1928-29 had been apparently the causative agent for the appearance of the late injury. This case also demonstrates the fact that late reactions may appear even nine years after the exposure.

ERNST A. POHLE, M.D., PH.D.

Remarks Concerning the Pre-operative Irradiation of the Cervix. A. Mayer. Strahlentherapie, 1930, XXXVII, 311.

The author has been studying the effect of pre-operative irradiation in carcinoma of the cervix on the mortality of surgical intervention. While it is too early to give definite statistical figures, the drop of the mortality rate in casses irradiated before operation was impressive. Roentgen rays and radium combined or either agent alone was used. Six weeks following the first treatment, a re-examination was the deciding factor as to the proper time for operation. If necessary, another treatment was given, and, if six weeks later the condition had not improved, the patient was considered inoperable. Pre-operative irradiation did not, in the author's experience, render the surgical removal of the uterus more difficult.

ERNST A. POHLE, M.D., PH.D.

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Attention is called to the fact that this index is primarily one of titles of papers and names. Titles of papers have been so inverted as to find alphabetical place under their key words. In certain instances, when no key word indicating the subject of the paper appeared in its title, such has been added in brackets. Singular and plural forms of key words have been indexed together; for example, *lung* and *lungs*.

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